MOVACOLOR

COLOR IN CONTROL

MC-Balance

User Manual 5.0.UK.01

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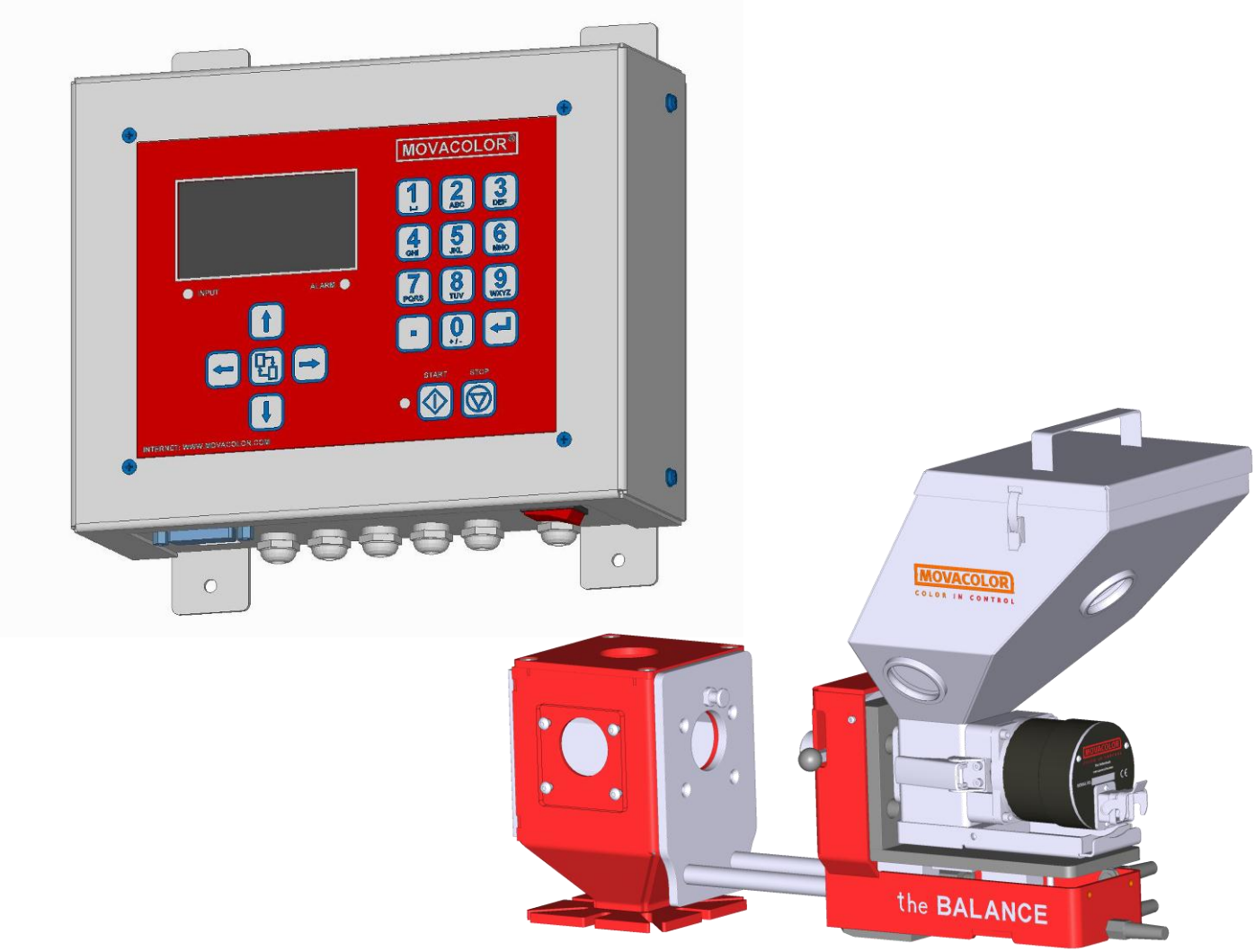

Movacolor B.V • Koperslagersstraat 31• 8601 WL Sneek • The Netherlands
Internet: www.movacolor.com • Email: info@movacolor.com
+ 31 (0) 515 570020 + 31 (0) 515 570021

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1. Introduction

Thank you for purchasing a Movacolor metering device. This manual is addressed to operators and **qualified technicians** taking care of the metering of dry additives to ensure correct use of the Movacolor dosing unit.
ⓘ IMPORTANT NOTE: THIS MANUAL MUST BE READ BEFORE INSTALLING THE DOSING UNIT. KEEP THIS MANUAL IN A PLACE ACCESSIBLE FOR ALL OPERATORS.

1.1 Symbols

ⓘ Important note

Attention; safety regulations for the operator

1.2 Terms

Operator: A person charged to operate, adjust, maintain and clean the machine.

Qualified Technician: A specialized, suitable trained person authorized to execute the installation, non-routine maintenance, or repairs requiring special knowledge of the machine and how it operates.

2. General information

2.1 Safety

The equipment is only designed and may only be used for the dosing of dry additives. Any use that is not in conformity with the instructions is considered improper and as such frees the manufacturer from any liability regarding damage to things and/or persons.

Before switching on the unit for the first time, ensure that the mains power voltage applied is between 80 and 260Vac.

Always switch off the Movacolor control cabinet and disconnect the mains power plug from electrical power before performing maintenance.

Ensure that all parts are securely fixed to the extruder or injection molding machine.

Dangerous voltages are present inside the control cabinet for up to 2 minutes after it has been switched off.

2.2 Certification

The Movacolor dosing unit is designed and produced in conformity with the following European regulations:

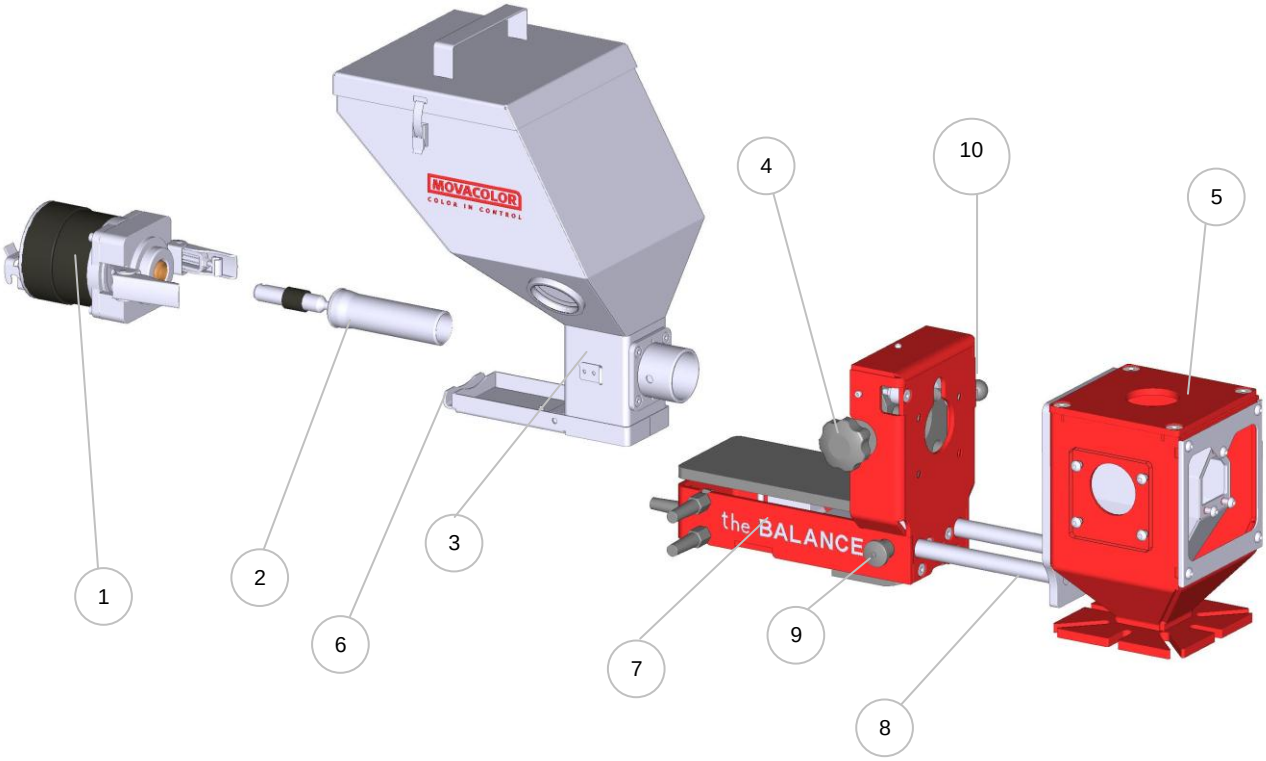
- CE standards for machinery (health, safety, environment)
- EMC (electromagnetic compatibility)
- VEM (safety electric material)
- 2006/42/EC (See the declaration of conformity, Appendix E)

2.3 Operating environmental conditions

- The unit must be protected against weather conditions
- Operating temperature -20 to +70 degr. C.
- Protection class: IP-50

3. Overview Dosing unit

3.1 MC-Balance Component overview



1 Stepper motor

2 Dosing system (Dosing cylinder)

3 Hopper 6 ltr

4 Curled knob M10x40

5 Standard NST40 Neckpiece

6 Material discharge slide (in closed position)

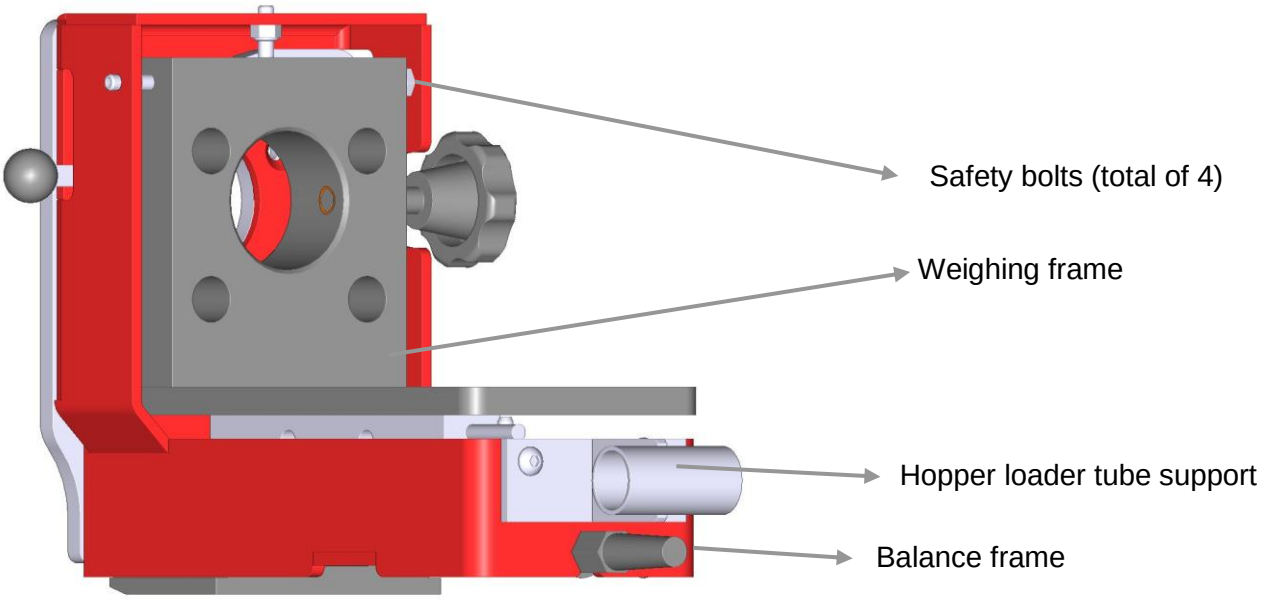
7 MC-Balance Load frame

8 OPTIONAL Slide frame

9 Slide locking bolt
(locking the slide-out position)
Only supplied together with the optional slide mechanism

10 Slide locking bar
(locking the slide-in position)
Only supplied together with the optional slide mechanism

3.2 Weighing frame



The black part is the weighing frame.
Do not touch this weighing frame (and dosing unit) while dosing.
It will have influence on the dosing.
Do not touch the safety bolts under the weighing platform. These are for overload protection.
There must be some space between de safety bolts and the frame.

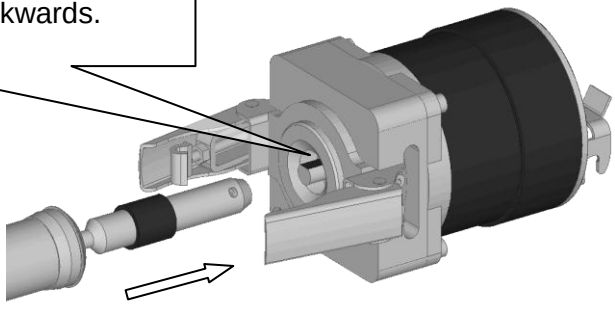
3.3 Motor and dosing system

There are mainly two dosing systems, the dosing cylinder and the feed screw.
(for more information see chapter 5)

The serial number of the motor can be found on the backside of the motor.

Motor axle:
The motor shaft is equipped with one flat side which fits exact in shaft of the dosing cylinder.

To connect the dosing cylinder just put it on the motor axle while turning it to find the flat side, than press the dosing cylinder completely backwards.



4. Metering principle

The Dosing Cylinder® of Movacolor combined with a very precise adjustable stepper motor ensures that the additive output is accurate and regular. The neckpiece (a mixing chamber) is designed to blend the main material and the additive homogeneously. Movacolor has on stock a large range of machine neckpieces that usually make a prefect fit to the injection molding machine or extruder. The most common mounting of the neckpiece is between the production machine and the hopper. In the figure below a cut through of the NST40 neckpiece can be seen.

Standard neckpiece

During operation, the virgin material runs from the machine hopper through the neckpiece into the machine. Inside the neckpiece the Virgin material flow is divided into two streams
by the cover plate. In the space below the cover plate, the rotating cylinder is dosing additive.

Additive is added directly into the center of the virgin material flow, just before it enters the production machine. This is a great advantage over metering devices that use batch pre-mixing because pre-mixing can actually cause material separation. Separation of materials results in an irregular additive flow into the production machine.

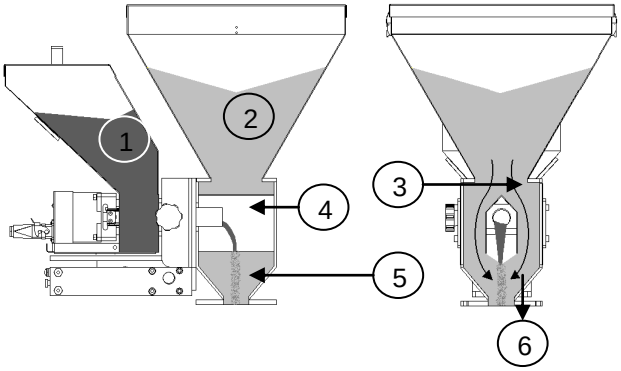


Fig. 3

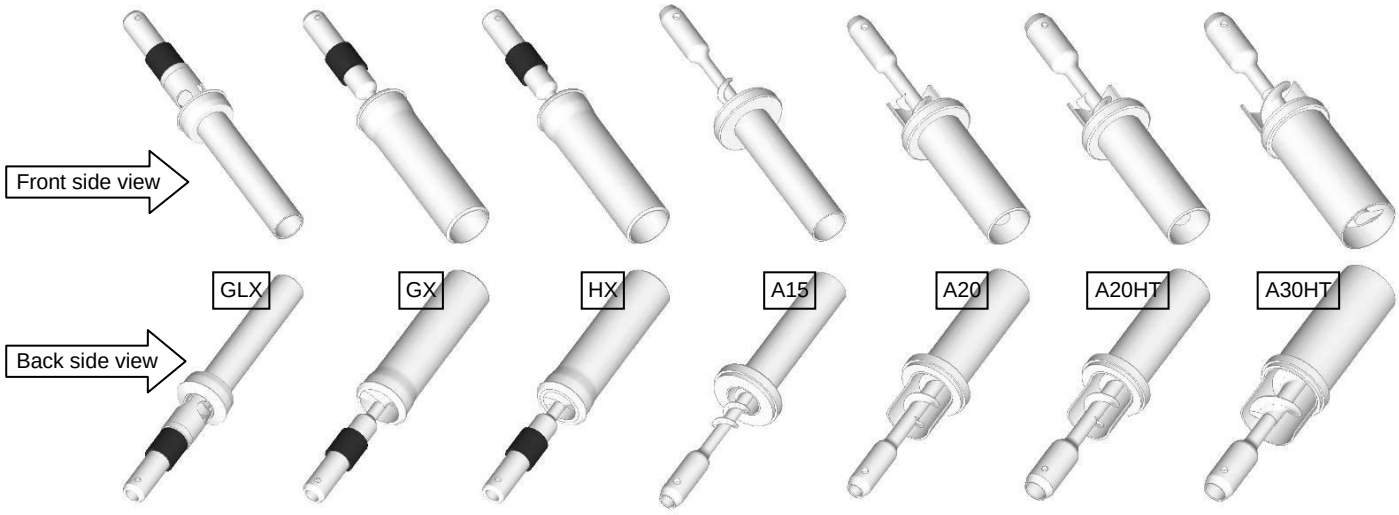
1. Color 2. Virgin material 3. Neckpiece 4. Dosing cylinder
4. Cover plate 5. Mixing zone 6. To production machine

5. Dosing systems / Capacities

Depending on the application a different dosing system might be needed.
Use the following table to determine roughly the best system for the application. For more detailed information please contact your agent or Movacolor.

Dosing system	Granular materials	Powder Materials	Accuracy	Dosing capacity Gram/sec.	Dosing capacity Kg/hour
GLX	**YES**	**YES**	**++**	**0,02 to 1,6***	**0,07 to 5,8***
GX	**YES**	**YES**	**+**	**0,2 to 5***	**0,72 to 18***
HX	**NO**	**YES**	**++**	**0,01 to 1,6****	**0,04 to 5,8****
A-15	**YES**	**YES**	**+/-**	**0,2 to 5***	**0,72 to 18***
Feed screw					
A-20	**YES**	**YES**	**+/-**	**0,5 to 20***	**1,8 to 72***
Feed screw					
A-30	**YES**	**YES**	**+/-**	**2,0 to 50***	**7,2 to 180***
Feed screw * **					

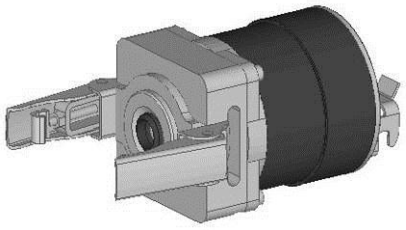
Note * measured with normal granular masterbatch 0,8 kg/dm3.
Note ** measured with free flowing powder 0,65 kg/dm3.
Note *** only available with high torque (4,5 Amp) stepper motor



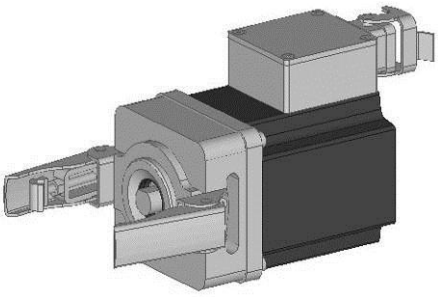
Which type of dosing system do I need with which neckpiece?

TYPE	CODE FOR STANDARD NECKPIECE	CODE FOR WATERCOOLED NECKPIECE OR SUPPORT FRAME	CODE FOR WATERCOOLED NECKPIECE AND SUPPORT FRAME
GLX	GLX	GLXC	GLXC/SF
GX	GX	GXC	GXC/SF
HX	HX	HXC	HXC/SF
A15	A15	A15C	A15C/SF
A20LT	A20	A20C	A20C/SF
A20HT	A20HT	A20HTC	A20HTC/SF
A30HT	A30	A30C	A30C/SF

All Movacolor dosing units are standard equipped with the stepper motor 2A (LT), in case of using the feed screw A30 the stepper motor 4,5A (HT) will be supplied. Also a screw A20 can be connected to the HT motor.



Stepper motor 2A
(LT)



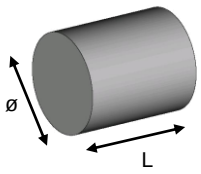
Stepper motor 4,5A
(HT)

ⓘ Do not select the HT motor if LT motor is connected. This will damage the motor.
If LT motor is selected and HT motor is connected there will be less motor torque and this can influence the dosing.

The controller of the dosing unit makes a distinction between two groups of materials, normal granules and micro granules. To determine the kind of material in your application use the description below.

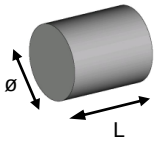
Material types

Normal Granules:
(NG)



ø < 4 mm L < 4 mm *

Micro / Mini Granules:
(MG)



The term Micro/Mini Granules also includes free flowing powder.

ø < ø2,5 mm L < 3 mm *

* For other sizes contact Movacolor.

The actual capacity of the dosing system depends on:

- The volume weight of the material *(bulk density)*
- The specific weight of the material *(specific density)*
- The granular shape of the material
- The granule size
- The surface structure of the material

Granular material can be normal or micro. The granular material and powder material has to be free flowing, non-static and not sticky.

6. Installation

6.1 Transport

To protect the Movacolor unit against damage during transport, the unit is packed in a cardboard box filled with polyurethane foam. Delivery terms are Ex-Works Sneek, The Netherlands. Buyer is responsible for the transport. Movacolor cannot be hold liable for any damage during transport.

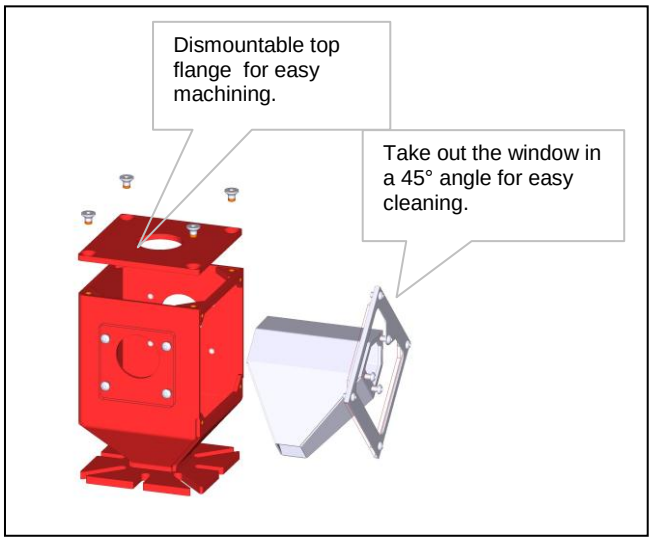
6.2 Receipt

Check the unit thoroughly upon receipt. Pass any remarks to the local agent or Movacolor within 8 days upon receipt of goods.

6.3 Mechanical Installation

Most mechanical parts are pre-assembled, making installation quick and simple.

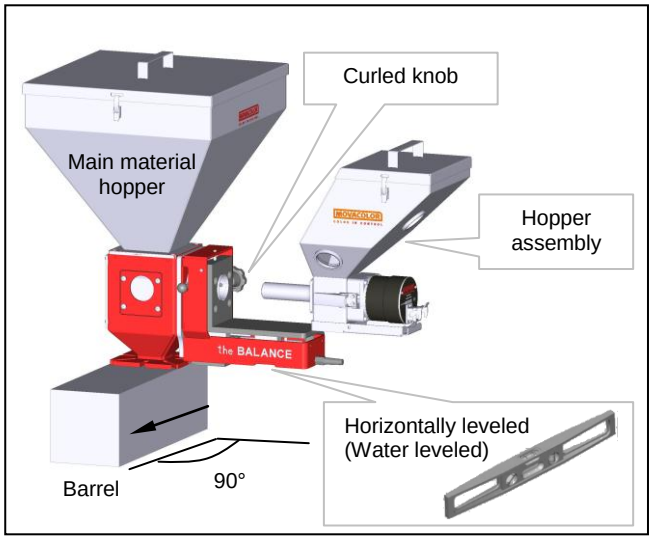
1. When installing a foreign main material hopper on top of the neckpiece, the **top flange** of the NST40 neckpiece need to be adapted. The lid of the neckpiece can be dismounted for easy machining.



2. -Install the neckpiece directly on top of the entrance of the production machine.
   -Install the neckpiece in a **90-degree** angle to the machine barrel. This will optimize the dosing accuracy in relation to vibrations of the production machine.
   -Make sure that the complete unit is mounted **horizontally leveled** and fixed securely.
   -Assure proper grounding to control cabinet, neckpiece and dosing unit

3. Connect the **hopper assembly** to the neckpiece by turning the **curled knob** clockwise. Make sure that the curled knob is tightened firmly.

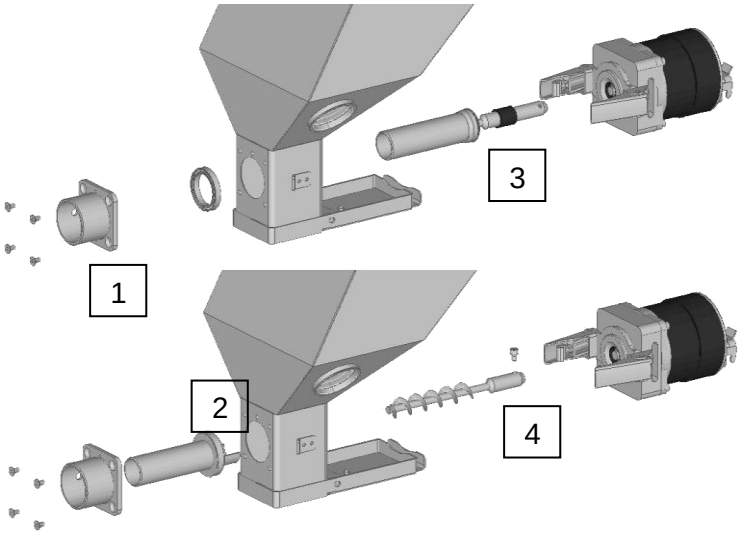
4. Mount the controller vibration free and conform specified temperatures.



**Install the neckpiece in a 90-degree angle to the machine barrel.
As shown in the picture.**

6.4 Changing from Dosing cylinder to Feed screw

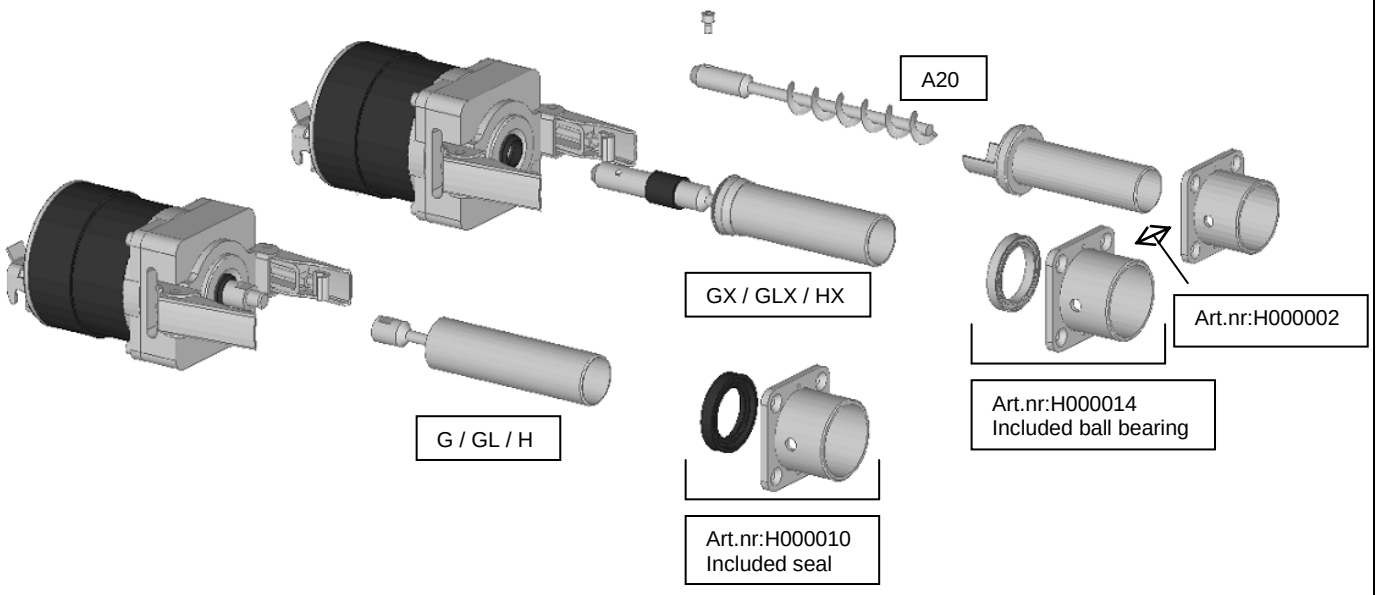
In relation to the maximum capacity of the dosing cylinder it might be necessary to change from dosing cylinder to feed screw. As distinction from the dosing cylinder the feed screw system is consisting of a rotating screw in a **non**-rotating tube.



To install the feed screw perform to following steps:

1. Detach the motor quick release clamps and take out the motor from the hopper.
2. Dismount the neckpiece connection flange (1) by removing 4 socket-head screws.
3. For use with a dosing cylinder the neckpiece connection flange (1) is equipped with a ball bearing. When using a feed screw system the ball bearing must be taken out. The metal ring (2) which is fixed on the feed screw tube fits directly on the neckpiece connection flange.
4. Dismount the dosing cylinder (3) and mount the screw (4) with the M5 bolt.
5. Place back the motor + screw by closing the motor quick release clamps.
   For cleaning the motor + screw can be easily be taken out.

POSSIBLE COMBINATIONS



BALL BEARING

ⓘ For cleaning of the ball bearing use a dry piece of textile or a smooth dry toothbrush to remove the dust or moisture and foreign particles that stick.

ⓘ Following points have effect on the lifetime of the ball bearing:
- Abrasive materials
- Temperature
- Dusty / fine powder materials

6.5 Electrical installation

The MC-Balance controller is standard equipped with 3 connections:

- Mains power cable
  ⓘ Before switching on the unit for the first time, ensure the mains power voltage being applied is between 80 and 260Vac.
- Input cable
- Motor cable

ⓘ Be aware that the cables will not be influenced by external circumstances as electromagnetic fields!

ⓘ Mount the controller on a place which is vibrations free and not hot!.

Optional are:

- Alarm flash light, complete with cable
- Compressed air solenoid valve complete with cable (for automatic hopper loader)

APPENDIX A SHOWS THE PRINT VIEW WHICH WILL BE EXPLAINED BELOW

1) PROCESSOR BOARD
The processor board is the heart of the controller.
This board must be fixed securely on the mainboard.
There's also a label on it with the Mac-address. This is the ID of the networkcard.
This address can also be seen in the startup screen.

2) EXTERNAL TERMINAL CONNECTION
This connector will be used when using an external terminal (Shielded cable max. 10 meter)

3) CONNECTION TO PC OR NETWORK

This connection (Ethernet) will be used when using a PC or network.
Max. length of the UTP network cable, type RJ45 (Cat. 5) is 100 meter between 2 network points.

4) INPUTS
Start input
The MC-Balance needs an input signal from the production machine in order to operate.
Three different input signals can be used to control the MC-Balance:
- Potential free start input.
- Potential (24 Vdc) start input
- Tacho (0-30 Vdc) start input

5) MOTOR
The MC-Balance can control 2 motor types:
- LT (low torque) standard motor for normal dosing
- HT (high torque) motor for high output dosing

(See chapter 5 for more details and wiring diagram for electrical connections, appendix C)

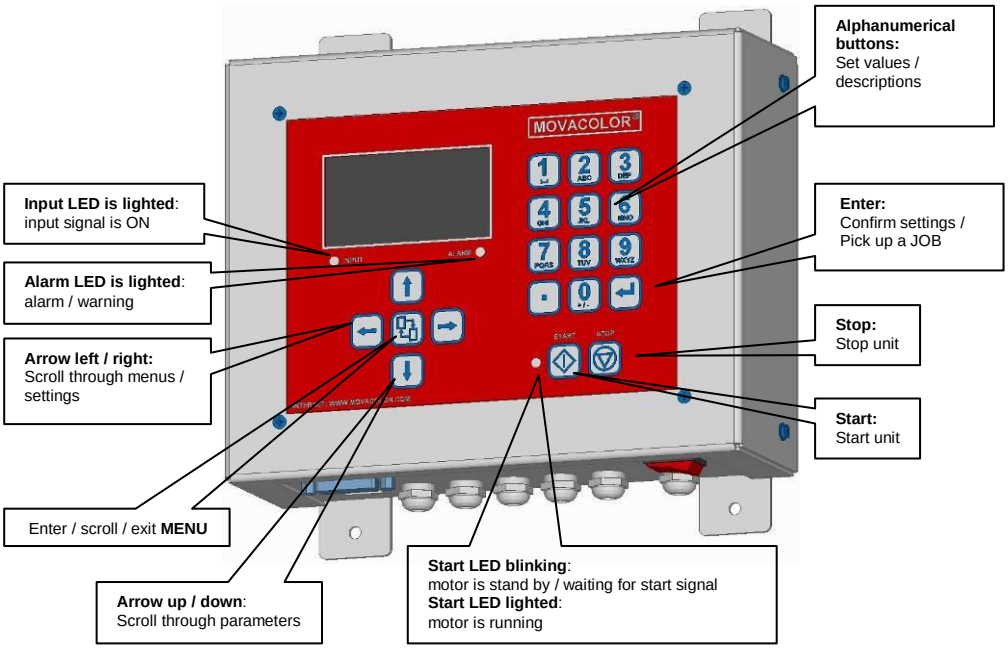
6) OUTPUTS
The MC-Balance has following outputs available:
- [clamp 24-25] Valve output for hopper loader, (Solid state 24VDC/0.5 A)
- [clamp 22-23] Warning output (Solid state 24VDC/0.5 A)
- [clamp 26-27] Potential free relay (normally open) output for Alarm (max. 230Vac/30Vdc, 5A)
- [clamp 28-29] Potential free relay (normally open) output for Running contact

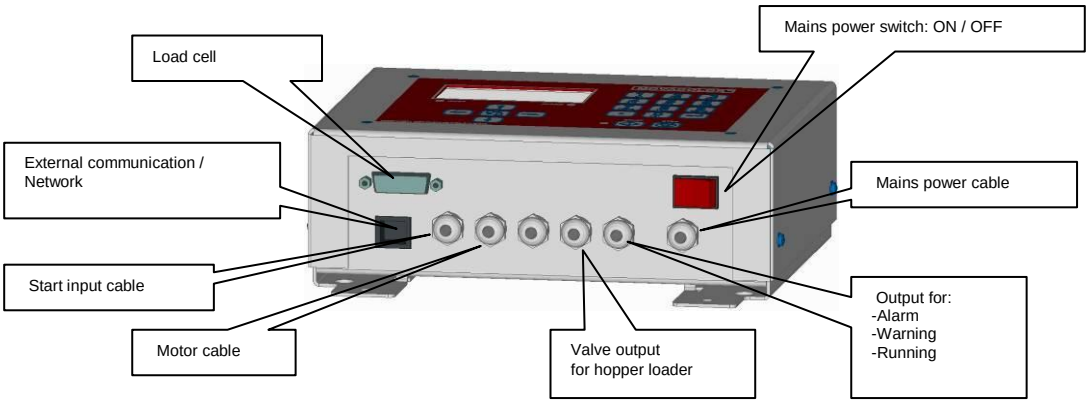
(max. 230Vac/30Vdc, 5A). This contact will be used to show that the motor is running.
The maximum total output power may be 12 Watt (Valve output + alarm output together max. 0,5A)
(See wiring diagram appendix C for electrical connections)

7) POWER SUPPLY
The MC-Balance will operate with a voltage from 80 VAC to 260 VAC, 50 and 60 Hz
by integrated automatic voltage selector.
(See wiring diagram appendix C for electrical connections)

7. Operation

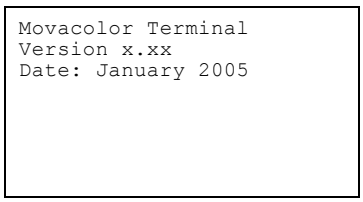
7.1 Navigation


MOVACOLOR
Alphanumerical buttons: Set values / descriptions
Input LED is lighted: input signal is ON
Alarm LED is lighted: alarm / warning
Arrow left / right: Scroll through menus / settings
Enter: Confirm settings / Pick up a JOB
Stop: Stop unit
Start: Start unit
Enter / scroll / exit **MENU**
Arrow up / down: Scroll through parameters
Start LED blinking: motor is stand by / waiting for start signal
Start LED lighted: motor is running

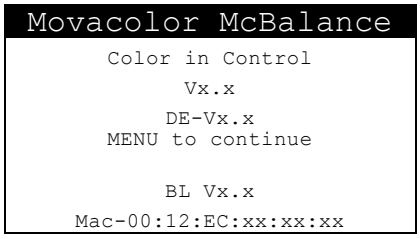


7.2 Start up & Login

Directly after switching on the mains power of the MC-Balance, the software versions will be displayed. In the first screen the software version of the terminal will be shown.



After a few seconds the second screen appears for 10 seconds.



Vx.x = user software version Vx.x
DE-Vx.x = Language version Vx.x
Standard language is English
DE means that the additional language is DEUTSCH (German).
BL Vx.x = bootloader software (firmware) Vx.x
Mac address = ID address of the network card

The MC-Balance controller has three user levels:
1. Operator **2.** Tooling **3.** Supervisor
The functions which are accessible per user level is shown in the table below.

The operator level is the lowest level, only the important settings for production can be done. The rest of the settings / menu's are invisible or locked.

For changing to another user level, enter the LOGIN menu and enter the password (4 numerals) and confirm. The passwords for the Tooling and Supervisor user levels can be defined by the supervisor in the CONFIGURATION <menu>.

		USER LEVEL Can be changed in LOGIN menu.		
MENU TITLE:	**FUNCTION:**	**SUPERVISOR** Default code 2222	**TOOLING** Default code 1111	**OPERATOR** Default code 0000
[LOGIN]	To enter the different user levels.	**YES**	**YES**	**YES**
[CONFIGURATION]	To configure the dosing system.	**YES**	NO	NO
[PRODUCTION]	To do the production settings. *In OPERATOR level jobs and materials are read only.	**YES**	**YES**	**YES***
[FILES]	To look for, rename or delete jobs and curves	**YES**	NO	NO
[HOPPER LOADER]	To do the hopper loader settings, only visible when a hopper loader is selected.	**YES**	**YES**	**YES**
[CALIBRATION]	To make material calibrations, only visible when control mode is set to GRAVI (Gravimetric).	**YES**	**YES**	NO
[LOAD CELL]	To calibrate the load cell.	**YES**	NO	NO
[WEIGHT CHECK]	To check the hopper or object weight.	**YES**	**YES**	NO
[CONSUMPTION]	View of the total quantity of material dosed by the MC-Balance.	**YES**	**YES**	NO
[ALARMS]	View of the alarm history *In TOOLING level the alarm configuration is invisible.	**YES**	**YES***	NO
[EVENT LOG]	The history of events or settings will be logged in this menu.	**YES**	NO	NO

ⓘ Recommended to note the passwords!

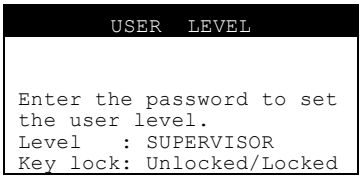
Forgot your supervisor password, enter the overall supervisor password **1689**.
When entering a wrong password the user level will be set automatically to operator level.

7.3 Keyboard lock

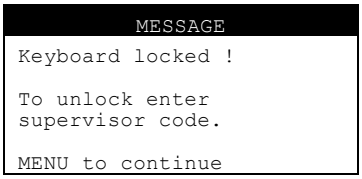
The keyboard lock function…

- is accessible in the [LOGIN] menu.
- can only be activated and deactivated with the SUPERVISOR login code.
- is only full functional in OPERATOR and TOOLING user level.
  For example: if the “Start user” setting is configured to “Supervisor”, the keyboard lock is deactivated as soon as the controller is switched OFF and ON.

The following screen will appear when the [LOGIN] menu is entered:



Press → or ← to select *Locked* or *Unlocked* and press Enter to confirm. When *Locked* selected the unit will automatic be set to OPERATOR level.



This screen will appear when a user is trying to change settings while the keyboard is locked. To unlock the supervisor code needs to be entered in the LOGIN menu.

With the keyboard lock ON it is still possible to…

- Shift between the LOGIN, PRODUCTION and HOPPERLOADER menu.
- To START and STOP the dosing unit.

For further information check the Start up & LOGIN paragraph (7.2).

7.4 Configuration

For initial setup the MC-Balance controller needs to be configured in the CONFIGURATION menu once. Depending on the configuration, some settings will be invisible in case they are not relevant.

ⓘ Highlighted Parameters are factory settings.

Language	: ENG / DE
Motor type	: LT / HT
Cylinder type	: GX / GLX / HX / A20 / A30
Material type	: NORMAL / MICRO
Cal dev.	: 5,0 %
Control mode	: GRAVI / RPM
Prod. Mode	: INJ / EXT
Input mode	: Timer / Relay / Tacho
Fill. System	: NO / ME / MV / EX
└ **EX HH level**	: 3500 gr.
└ **EX H level**	: 2500 gr.
└ **Filling start**	: 800 gr.
Hopper empty	: 700 gr.
Deviationalarm	: 25 %
Jobs enabled	: NO / YES
Auto start	: NO / YES
Master reset	: NONE / ALARM / MATER / JOBS / ALL
IP	: xxx . xxx . xxx . xxx (For example: 192.168.001.001)
Name	: xxxxxxxxxxxxxx
Start user	: Operator / Tooling / Supervisor
Tooling passw.	: xxxx 1111
Supervisor passw.	: xxxx 2222
Conversion	: Metric / Imp / kg/h
Full scale	: xx.xx kg
Modbus unit	: 1-231
Date	: (dd / mm / yy)
Time	: (hh / mm / ss)

***Configuration:* Language**
Standard language is English. On request also different languages are available.

***Configuration:* Motor type**
LT is Low Torque motor and HT is High Torque motor (see chapter 5 for more information)
ⓘ Do not select HT motor if LT motor is connected.

***Configuration:* Cylinder type**
Type of dosing cylinder / feed screw (see chapter 5 for more information)

***Configuration:* Material type**
Type of material, normal granules (NORMAL) and micro granules (MICRO).
(see chapter 5 for more information)

***Configuration:* Cal dev.**
The maximum allowed deviation from the Calibration Setpoint can be set with this Parameter. (For more information see chapter 7.6)

***Configuration:* Control mode**
(GRAVI) Gravimetric mode or (RPM) Rotating mode

- Gravimetric mode is set as default and operates on the base of loss-in-weight principle. The output is measured and regulated continuously by controlling the motor speed.
- Volumetric mode (RPM) can be used if no automatic feedback of the weight is required. The weighing will not function in this mode and also the automatic hopper loader function will not work.

***Configuration:* Prod. mode**
Production mode
Selection of the machine on which the MC-Balance is placed.
(EXT) extruder or (INJ) injection molding

***Configuration:* Input mode**
Type of input signal. Relay, Timer or Tacho
Timer mode is the standard setting for Injection molding.

	EXT		**INJ**	
timer			x	x
relay	x	x	x	
tacho	x	x		
	GRAVI	RPM	GRAVI	RPM

ⓘ Input mode is not visible in RPM prod. Mode. (Timer is used automatically)

ⓘ For INJ in timer mode the start pulse should be min. 0,2 seconds.
For INJ in relay mode the start signal should be as long as the dosing time.

If INJ-Relay is selected the dosing machine will follow the machine relay time.
The controller will filter small changes out so that the regulation is not being influenced.
Big changes will be followed.
The screen shows the real machine relay time.

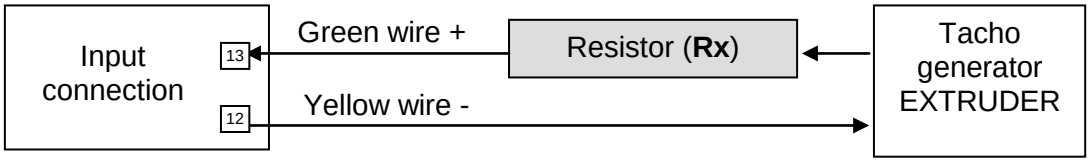
Input (start) signal
The MC-Balance needs an input signal from the production machine in order to operate.
Three different input signals can be used to control the MC-Balance.

1.) *A potential free relay contact.*
Use the white and brown wire for the potential free contact.

2.) *A relay signal 24 Volt DC*.*
In case of a powered relay signal connect the white wire to +24 VDC and the yellow wire to the 0 VDC.
* Note potential contact
Guaranteed OFF: 0-8VDC
Guaranteed ON: 18-30VDC

3.) *A tacho signal up to 30 Volt DC.*
This is used when the MC-Balance needs to be connected to an extruder that has a tacho generator that produces a voltage linear to the extruder speed. When using a tacho generator signal, make a connection between the white and brown wire. It will function as a start signal. Connect green to + VDC and yellow to the - side of the generator.

The maximum voltage that can be applied to the MC-Balance is 30 VDC. The tacho voltage has to be reduced to 30 VDC if the tacho generator has a higher voltage output than 30 VDC at the maximum extruder output capacity. See the diagram below.

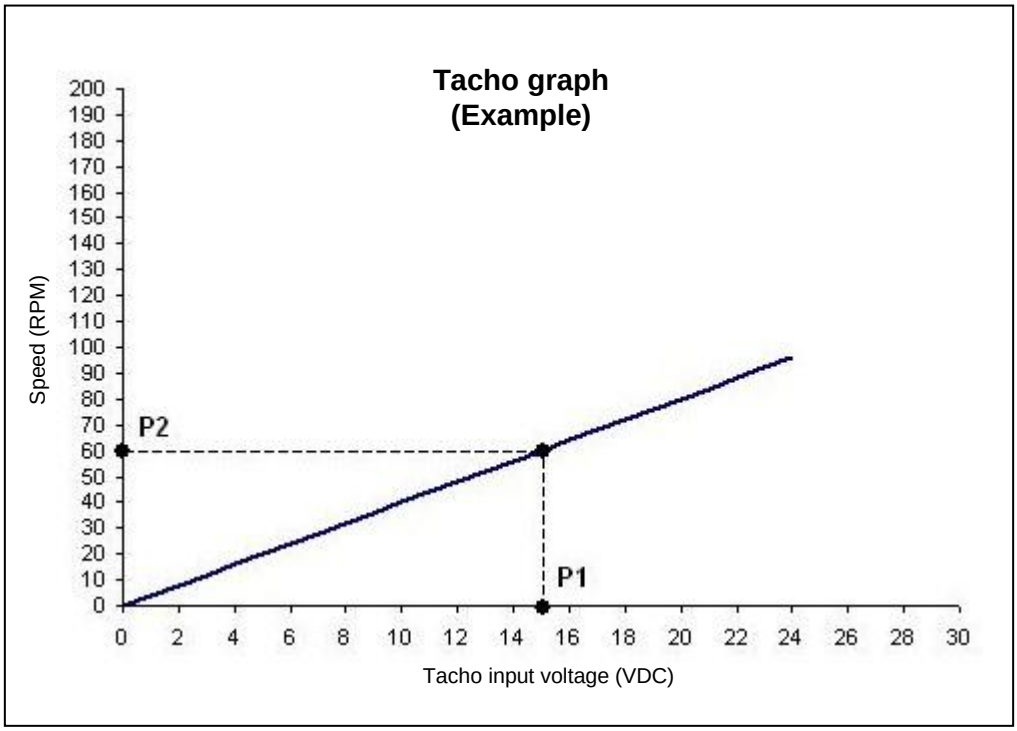


Rx (**kilo-Ohm**) = (2,684 x (Max. tacho output VDC – 5)) – 66

If the extruder stops when connected to the metering unit, an isolated signal converter is needed. Contact your agent or Movacolor for more information.

Tacho function
The tacho function is only available in extrusion mode.
This function can be used with extrusion when it is necessary that the dosing rate is automatically adjusted to the extruder speed. In tacho mode an input voltage is linked to a dosing speed setting. If the extruder speed changes, the tacho input voltage and speed of the dosing unit will change accordingly.

A linear correlation between extruder speed (tacho input signal) and the needed dosing speed is assumed. See graph.



The tacho function can be set in the PRODUCTION screen.
Tacho can be set automatically and manually:

Max tacho: 0.0V
Set tacho: NO / YES
ⓘ Highlighted Parameters are factory settings.

Manual:
Fill in the voltage the tacho produced by the tacho generator at maximum extruder speed.

Automatic:
Let the extruder run and select Set tacho: **YES**.
The tacho voltage P1 will be taken over automatically and is linked to the set motor speed P2 (in RPM mode) or calculated motor speed (in GRAVI mode)

During production, the motor speed P2 can be changed. The new speed is linked to the previous stored voltage and the graph will change accordingly.

During production, the voltage P1 can be adjusted to the current tacho input voltage (manually or automatically) as shown above. The new voltage is linked to the previous stored speed and the graph will change accordingly.

-The maximum voltage that can be applied to the MC-Balance is 30 VDC.
-The tacho signal must be a clear signal. Any failure in the voltage signal will be followed by dosing variations.

Configuration: **Fill. System**
Filling system, NO(None), ME, MV or EX (see chapter 7.10)

Configuration: **Filling start**
Function: When it is detected that the hopper is running empty the filling system will switch on.
The filling system will start loading when the weight in the hopper is 800 grams (default) or less.
The default value can be changed manual if necessary (depending on the material properties).
Also with EX hopper loader selected this is the weight level for opening the knife gate valve to fill the hopper.
ⓘ Only visible when a filling system is selected.

Configuration: **EX-H level**
The filling knife gate valve will close if the weight in the hopper is 2500 grams (default) or more.
ⓘ Only visible if EX (External / foreign) hopper loader is selected.

Configuration: **EX-HH level**
HH level is High level warning. If the weight in the hopper reaches 3000 grams (default) or more a warning will be given.
ⓘ Only visible if EX (External / foreign) hopper loader is selected.

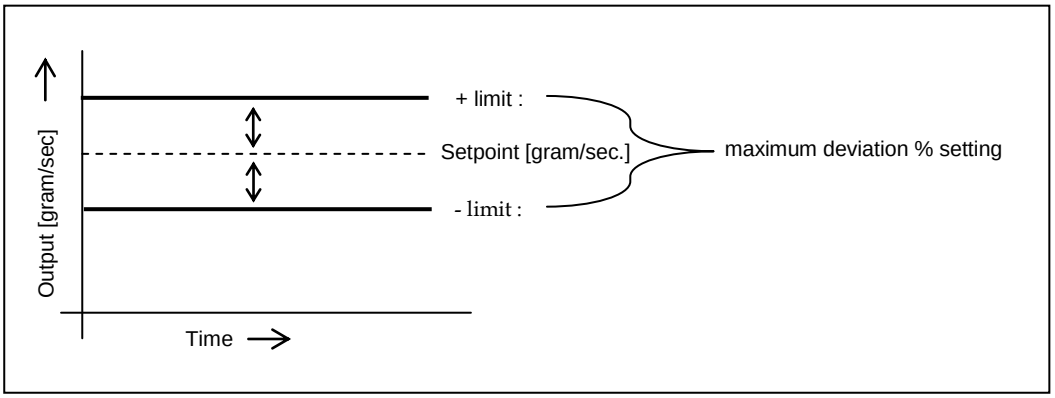
Configuration: **Hopper empty**
The system will give an “Low hopper level” message if there is less then 700 (default) grams of material in the hopper. For this system to work correctly it is necessary that the load cell calibration is done with an empty hopper and the hopper lid in place. This system will always be active.
The default value can be changed manual if necessary (depending on the material properties).
See also chapter 7.12 for how to set this message to alarm or warning.

***Configuration*: Deviationalarm**
Setting for the “Maximum deviation exceeded” message.

The MC-Balance automatically adjusts his motor speed to the desired setpoint. The controller is able to detect and alarm when the setpoint is not reached within a set percentage. If after the normal performed speed adjustments the setpoint is consistently not reached, the controller will give an alarm signal and message in the display.

If the setpoint it not reached within the set percentage this can be caused by:
- Partial or complete blockage by sticky or hard flowing material.
- Inaccurate dosing because material is not uniform in size.
- Disturbance of the weight signal, for example by mechanical blocking of the MC-Balance loadframe.

The Maximum deviation setting can be set in the CONFIGURATION menu:
Deviationalarm: xx% (1-99%)



Example:
The Deviationalarm setting in the configuration menu is default set to 25%
The set point (color set) is set to : 1,000 gr/sec
-the MAXIMUM limit value will be : 1,250 gr/sec
-the MINIMUM limit value will be : 0,750 gr/sec

When the maximum deviation message (Error 01, page 33) appears in the display of the controller it shows the measured deviation in percentage of the setpoint.

***Configuration:* Jobs enabled**
Enable / disable production job functionality (see chapter 7.9)

***Configuration:* Auto start**
Enable / disable auto startup after Voltage dip or mains power has been switched OFF.
When enabled the unit will continue dosing automatically after a Voltage dip or mains power has been switched OFF.

***Configuration:* Master reset**
Reset alarm history (ALARMS). All alarm/warning messages saved in the alarm history will be Removed.
Reset material calibrations (MATER.) All material calibrations will be removed.
Reset production jobs (JOBS). All Jobs will be removed.
Reset these three together (ALL). Alarm history, material curves and jobs will be removed.

***Configuration:* IP**
IP-address for use in a network environment (TCP/IP protocol). (For example 192.168.001.001)
When a MC-Balance is part of a network, the controller must have an IP-address for identification.
ⓘ This IP-address has to correspond with the IP-address of your computer. Ask your network administrator for a unique address.

***Configuration:* Name**
Give a name or figures for individual identification (for use in network).
For example the name of the machine the dosing unit is mounted on.

Configuration: **Start user**
User level to start up with, when switching on the controller's mains power.
Operator, Tooling or Supervisor.

Configuration: **Tooling passw.**
Password for Tooling user level, 4 numerals, default 1111

Configuration: **Supervisor passw.**
Password for Supervisor user level 4 numerals default 2222

Configuration: **Conversion**
Selection of Units: Metric = European [gr/s]
Imperial = US [lbs/hr]
Kg/h = In extrusion mode the capacity will be shown in kg/h instead of gr/s

Configuration: **Full scale**
Selected loadcell will be shown (read only)

Configuration: **Modbus unit**
If the controller is used in a Modbus network, the unique identity can be filled in here (1-231)

Configuration: **Date**
Actual date (dd / mm / yy)

Configuration: **Time**
Actual time (hh / mm / ss)

ⓘ ***Date and Time will be stored for minimal 1500hrs. with controller switched OFF.***

7.5 Loadcell calibration

When using a MC-Balance for the first time do an initial **load cell calibration** as follows:

- The unit must be mounted horizontally (water leveled)
- Avoid vibrations during the load cell calibration. This will influence the calibration.
- Do not touch the unit during load cell calibration.
- When using a slide the whole unit has to be slid in against the neckpiece and fixed.

- Be sure that the Balance load cell is connected to the controller
- Go to the LOAD CELL <menu>
- In this menu it is possible to calibrate the load cell of MC-Balance (500gr. Calibration weight required)
- Select YES to start the load cell calibration

```
LOADCELL CALIBRATION

        [***]


Status
Calibration busy.
Please wait……..
```

[***] = Progress

- After a few minutes the following screen appears:

```
LOADCELL CALIBRATION

        [***]


Status
Place weight, press
START when ready.
```

Place calibration weight (500 gr.) on the hopper and press the START button

- After approx. 1 minute the load cell calibration is ready, press the MENU button to continue.
- To check if the load cell calibration was OK, go to the WEIGHT CHECK <menu>

```
WEIGHT CHECK

Weight:       gr.  ><
Object:       gr.

Zero:   NO/YES
```

><:	Standstill sign. When the vibrations are too big, this sign disappears!
Weight:	Actual weight on the weighing scale (gram)
Object:	Object weight (gram)
Zero:	Zero YES / NO. Reset the object weight.

- Zero the object weight
- Place 500 gr. calibration weight on the Hopper
- If the object weight is not corresponding with the real weight, perform a load cell calibration.

7.6 Material Pre-calibration

The MC-Balance mainly can be started in two ways:

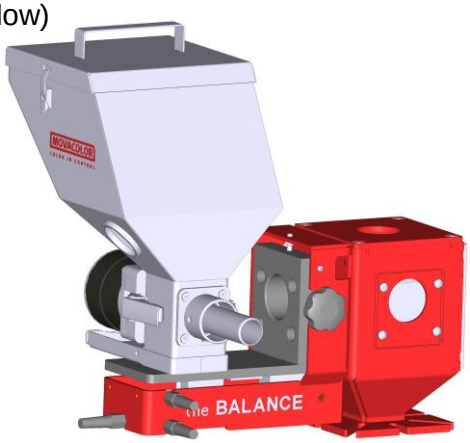
1) Start the unit **without pre-calibration** of material.
After pressing the START button the unit starts dosing on a speed that is based on default curves which are pre-programmed in the controller. After start up the unit continues with self calibrating to the Setpoint.

2) Start the unit **with pre-calibration** of material (OFF-LINE).
After pressing the START button the unit starts dosing on an speed that is based on material calibrations made by the user which are stored in the controller. After start up the unit continues with fine tuning to the Setpoint.

What is the function of a material Pre-calibration ?
With a pre-calibration it is possible to calibrate the unit before production is started, in this way the time needed to come in spec. can be reduced. The MC-Balance is a gravimetric / loss in weight dosing unit. When starting up the dosing unit for a new production run there is no direct information available about the loss in weight. Of course you want the dosing unit to reach his setpoint with the matching speed of the motor (RPM) as quick as possible. Starting the unit with a speed that is already most near to the set point will achieve quick regulation. The correct RPM at the start of the dosing unit can be determined automatically with a pre-calibration.

The pre-calibration can be done in two ways (see below)

1) Unit with option slide frame:
Slide the frame with unit backwards till the “click”



2) Unit without optional slide mechanism:
Take out the dosing unit and put it on the frame like shown

- It is important that during calibration the dosing unit is mounted fixed and horizontally and also vibration free.
- Before starting a material calibration be sure the hopper is filled with material sufficient.
- Be sure that the loadcell cable is connected to the MC-Balance controller.

Following parameters will be stored with a Material calibration, depending on the configuration:

- CONFIGURATION parameters: Cylinder type : type of dosing cylinder or feed screw
  Material Type : Normal or micro-granules
- PRODUCTION parameters: Shotwth. : Shot weight
  color% : Color amount (%)
  dos.time : Dosing time (sec)
  Ext. cap. : Extruder capacity (kg/h)
- CALIBRATION parameters: Material name : Name of calibrated material

How to make a material calibration?

- Go to the CALIBRATION menu.
- Enter Material name and your production parameters.
- Start calibrating. The following screen appears:

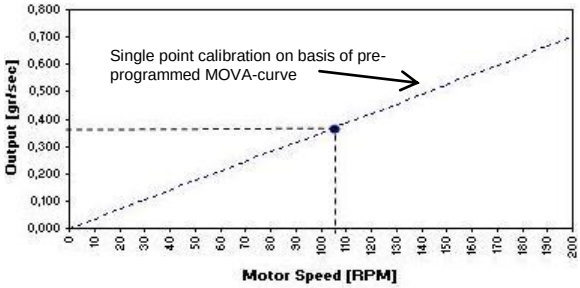
```
        CALIBRATION
       [TESTING BUSY]
          [*****]

Set    : 1,000 gr/s
Actual : 0,945 gr/s
Stop & Store : YES/NO
```

- The calibration will take minimal about 3 minutes but can take more time depending on the used material and production parameters.
  It is possible to stop ⊽ during the calibration (for example to refill the hopper).
  To continue select YES and confirm. To stop select NO and confirm.
- The calibration will automatically be finished and saved after the Setpoint is reached within the set calibration deviation (Cal dev: default = 5%) set in configurations menu. (see chapter 7.4)
- After saving you will automatically go to the PRODUCTION menu and stored calibration is automatically selected.

ⓘ Stored material curves have a ***** after the filename.

During the calibration the unit is regulating to his Setpoint. When this point is reached the calibration will be saved automatically. On the basis of this point a complete curve is made on bases of default pre-programmed curves.

Material Calibration



It is also possible to save the actual material calibration during a running production process. This function is called the "**Save data Function",** for more information see chapter 7.8

How can I select a calibrated material?

When one or more material calibrations are made, one of these can be selected as follows:

- Go to PRODUCTION <menu>
- Use the cursor to go to Material.
- Press 2 seconds on the <enter> button
  A list will appear with stored material calibrations
- Select one with arrow buttons and confirm

If the material calibration made is not in the list fill in the first letter(s) and confirm. Now a filtered list appears. To go back to the main list fill in spaces and confirm.
It is also possible to fill in the material description immediately in the PRODUCTION <menu> and confirm. The message **"Material not found, select new material"** appears when a false material is filled in. To clear the material description fill in spaces or select an empty material calibration out of the list.

How can I delete or rename a calibrated material?

To delete one or more material see chapter 7.13.
To delete all Materials select master reset MATERIAL in the CONFIGURATIONS <menu> and confirm.

7.7 Production

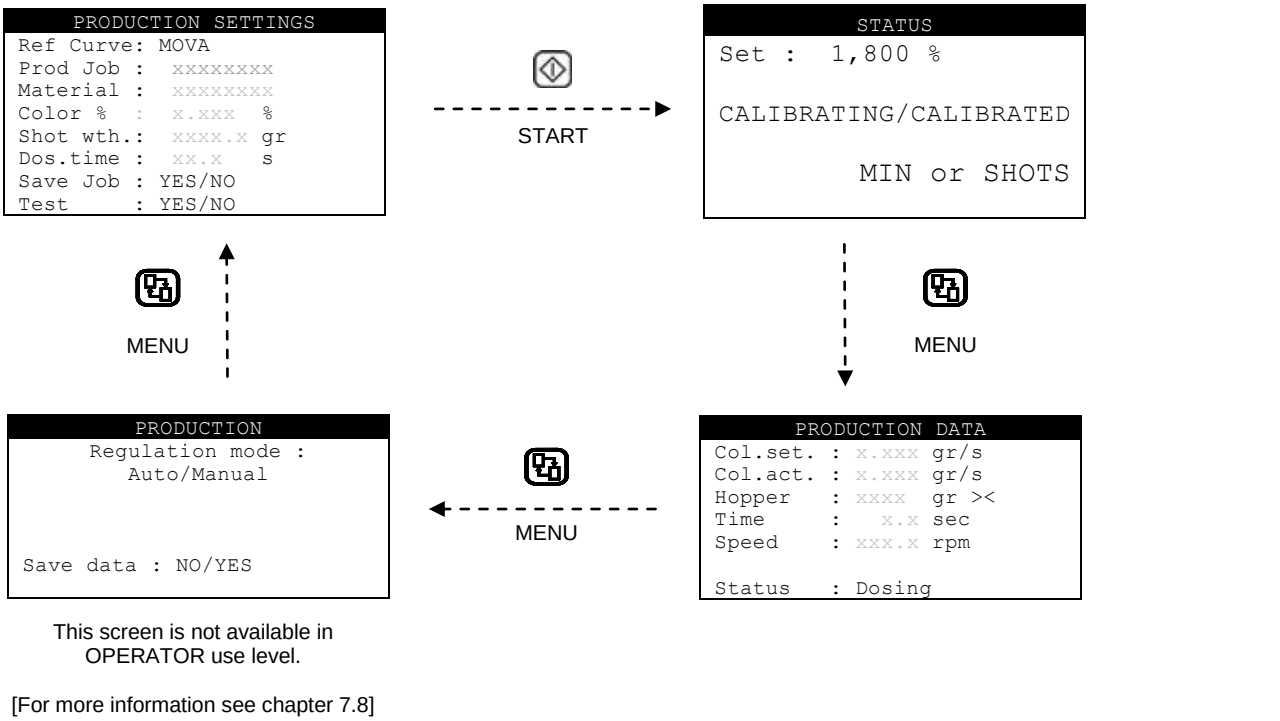
ⓘ The rotation direction of the dosing at the front view must be to the right

Production (Motor On/Off)
Press the start button to start dosing, the question appears: Fill cylinder? YES/NO.
YES means that the dosing cylinder will be filled before production.
The start LED blinks when the unit is waiting for an input signal.
The unit is dosing if the Start LED lights continuously.
When the unit is started the actual production data will be shown.
Press the stop button to stop production.

ⓘ Please notice that it is possible that the first dosing(s) are not sufficient, because of the cylinder filling with material.
It takes some time to stabilize.

4 levels of production screens:
The unit will switch automatically to the STATUS screen.

In INJ mode the remaining nr. of shots will be shown
In EXT mode the remaining production minutes will be shown
Calculated with the actual hopper weight and hopper empty weight



This screen is not available in OPERATOR use level.

[For more information see chapter 7.8]

.

Test function
With the test function the unit will dose material with the set dosing time and set / calculated speed.
ⓘ In Extrusion mode the unit will dose 30 seconds.
Do a test as follows:

- Go to PRODUCTION <menu>
- Fill in the production settings
- Use the arrow buttons to go to Test
- Select YES and confirm ↵.
- The unit will run with the set parameters.

It is possible to stop the test with the stop button.

INJECTION MOULDING

The following parameters can be seen in the production screen, depending on operation or settings (made in supervisor mode):

Injection molding / Gravimetric mode

Production Settings

```
    PRODUCTION SETTINGS
Ref.Curve: MOVA/USER
Prod Job : xxxxxxxx
Material : xxxxxxxx
Color %  : x.xxx  %
Shot wth.: xxxx.x gr
Dos.time : xx.x   s
Save job : NO/YES
Test     : NO/YES
```

Ref.Curve: Type reference curve, MOVA pre-programmed curve, or USER defined curve.
Prod Job : Name of the production Job
Material : Name of material calibration
Color % : Color amount (%)
Shot wth : Shot weight (gr.)
Dos. time : Dosing time (sec.) ⓘ**Dosing time only visible in Timer mode**
Save job : Save actual production settings into a job
Test: : Initial production test with set speed and time

Actual production data

```
      PRODUCTION DATA
Col.Set.  : x.xxx gr/s
Col.Act.  : x.xxx gr/s
Hopper    : xxxx  gr ><
Time      : xx.x  sec
Speed     : xxx.x rpm


Status    : Dosing
```

Col.set. : Calculated output (gr/sec)
Col. act. : Actual color output (gr/sec)
ⓘ**actual color output is only visible after the first automatic RPM adjustment.**
Hopper : Material weight in the hopper
>< : Standstill sign. When the vibrations are too big, this sign disappears!
Time : -count down of the actual dosing time (sec), when working TIMER input mode.
-average dosing time (sec), when working in RELAY input mode.
Speed : Actual motor speed (RPM)
Status : Status of the dosing, Standby / Dosing / Filling

Injection molding / RPM mode

Production Settings

```
    PRODUCTION SETTINGS
Prod Job :   xxxxxxxx
Set speed:   xxx.x rpm
Dos.time :   xx.x  s
Save job :    NO/YES
Test     :    NO/YES
```

Prod Job : Name of the production Job
Set speed : Set motor speed (RPM)
Dos.time : Actual dosing time (sec), measured from relay
Save job : Save production settings into a job
Test: : Initial production test with set speed and time

Actual production data

```
      PRODUCTION DATA
Speed    :   xxx.x rpm
Time     :    xx.x sec




Status   : Dosing
```

Speed : Actual motor speed (RPM)
Time : Count down of the actual dosing time (sec)
Status : Status of the dosing, Standby / dosing / filling

ⓘ **RPM mode needs always a set dosing time, relay function is not functional.**

EXTRUSION

Extrusion / Gravimetric mode

Production Settings

```
PRODUCTION SETTINGS
Ref Curve : MOVA/USER
Prod Job  : xxxxxxxx
Material  : xxxxxxxx
Color %   : x.xxx   %
Ext.cap   : xxxxx.x kg/h
Max tacho:  xxx,x   v
Set tacho:  NO/YES
Save job :  NO/YES
Test     :  NO/YES
```

Ref.Curve: Type reference curve, MOVA pre-programmed curve, or USER defined curve.
Prod Job : Name of the production Job
Material : Name of material calibration
Color % : Color amount (%)
Ext.cap : Maximum extruder capacity (kg/h)
Max tacho : Maximum tacho voltage (v) ⓘ**Only visible in Tacho mode**
Set tacho : Autom. voltage take over from tacho generator ⓘ**Only visible in Tacho mode**
Save job : Save production settings into a job
Test: : Initial production test with set speed for 30 seconds.

Actual production data

```
PRODUCTION DATA
Ext.act.    : xxxxx.x kg/h
Act tacho   : xxx,x   v
Col. Set.   : x.xxx   gr/s
Col. Act.   : x,xxx   gr/s
Hopper      : xxxx gr ><
Speed       :         rpm


Status      : Dosing
```

Ext. act : Actual extruder capacity (kg/h)
ⓘ**Only visible in Tacho mode**
Act tacho : Actual voltage of the tacho generator (v)
ⓘ**Only visible in Tacho mode**
Col. set : Calculated output (gr/sec)
Col. act. : Actual color output (gr/sec)
ⓘ**actual color output is only visible after the first automatic RPM adjustment.**
Hopper : Material weight in the hopper
>< : Standstill sign. When the vibrations are too big, this sign disappears!
Speed : Actual motor speed (RPM)
Status : Status of the dosing, Standby / Dosing / Filling

Extrusion / RPM mode

Production Settings

```
PRODUCTION SETTINGS
Prod Job : xxxxxxxx
Set speed  xxx.x     rpm
Max tacho: xxx.x     v
Set tacho: NO/YES
Save job : NO/YES
Test     : NO/YES
```

Prod Job : Name of the production Job
Set speed: Set motor speed (RPM)
Max tacho : Maximum tacho voltage (v)
ⓘ**Only visible in Tacho mode**
Set tacho : Autom. voltage take over from tacho generator
ⓘ**Only visible in Tacho mode**
Save job : Save production settings into a job
Test: : Initial production test with set speed and time

Actual production data

```
PRODUCTION DATA
Act tacho :  xxx.x     v
Speed     :  xxx.x     rpm




Status    : Dosing
```

Act tacho : Actual voltage of the tacho generator (v) ⓘ**Only visible in Tacho mode**
Speed : Actual motor speed (RPM)
Status : Status of the dosing, Standby / dosing / filling

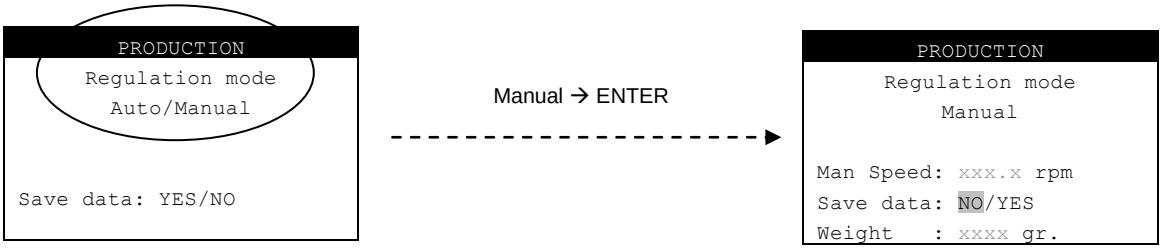
7.8 Auto/Manual regulation mode & Save data function

Two functions are available in one screen:
- Regulation mode: Auto/Manual
- Save data function.

ⓘThese two functions are not available in OPERATOR user level.

Regulation mode: Auto/Manual

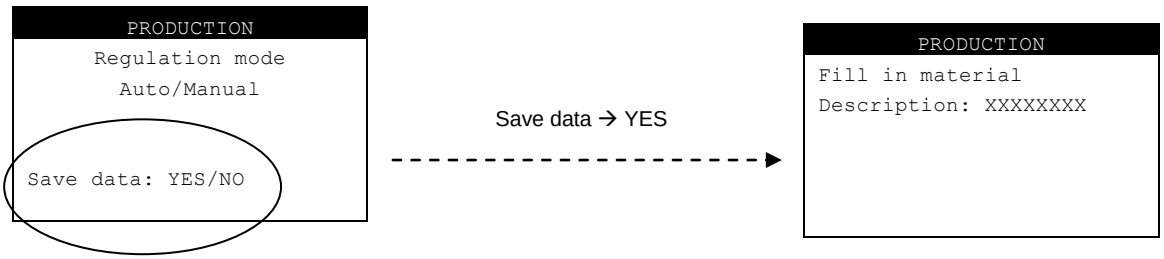
This function allows to switch during production from automatic control (gravimetric) to manual control (RPM). [Only accessible in Motor ON status, not in operator user level]



In this screen the rpm can be changed.
-When changing back to Auto mode without saving data, the unit will direct go back to his “old” rpm and will continue self calibrating.
-When changing back to Auto mode after saving data (manual entered speed), the unit will first keep the manual set speed but will self calibrate to the entered setpoint.

Save data Function

This function allows to store the actual data once the dosing unit shows an actual value (color actual). A material description needs to be entered to save this data. A full material curve on basis of the stored point will be saved in the memory of the controller under the entered name.
Starting a new production run with a previous stored material calibration/speed is now possible,



7.9 Production JOB

What is a production job?
In a production job the relevant production data will be stored.
Following data will be stored in a JOB, depending on the configuration:

CONFIGURATION settings:	Control mode :	GRAVI / RPM
	Prod. Mode:	INJ / EXT
	Input mode:	Timer / relay / tacho
PRODUCTION settings:	Job description:	Name of the job
	Shot wth.:	weight of the part
	color% :	color amount (%)
	dos.time:	dosing time (sec.)
	Ext. cap.:	Extruder capacity (kg/h)
	Max. tacho:	Maximum tacho voltage (v)
	RPM:	motor speed (RPM)
CALIBRATION:	Material calibration:	stored material calibration

How can I use a production job?
ⓘ Production Job is only visible if enabled in CONFIGURATION <menu>
First enable the Job functionality in CONFIGURATIONS <menu>
A production Job can be made in the PRODUCTION <menu>

- Fill in the production settings
- Go to save Job
- Select YES
- Give the Job a description (max 8 characters)
- Save YES
- Confirm with <enter>

All the settings as described above will be stored.
The Job will be selected in the PRODUCTION settings screen immediately.

How can I select a production job?
When one or more jobs are made, one of these can be selected as follows:

- Go to PRODUCTION <menu>
- Use the cursor to go to Prod job.
- Press 2 seconds on the <enter> button
- A list will appear with stored Job files
- Select one with arrow buttons and confirm

ⓘ When using a production job, the set configuration will be overwritten.

If the job made is not in the list fill in the first letter (s) and confirm. Now a filtered list appears.
To go back to the main list fill in spaces and confirm.

It is also possible to fill in the job description immediately in the PRODUCTION <menu> and confirm. The message **"Job not found, select other job"** appears when a false job is filled in.
To clear the job description fill in spaces or select an empty job out of the job list.

How can I delete or rename a production job?
To delete or rename one or more jobs see chapter 7.13
To delete all jobs select master reset JOBS in the CONFIGURATIONS <menu> and confirm.

7.10 Filling the hopper.

MANUAL FILLING

The controller automatically detects when the hopper is manual filled.
In the period that the hopper is being filled, the MC-Balance is dosing with a fixed RPM, this means the unit runs temporarily volumetric. As soon as the hopper filling is ready, the MC-Balance immediately continues to work gravimetric.

AUTOMATIC FILLING

ⓘ Only use Movacolor hopper loaders to fill the hopper automatically.
Foreign hopper loaders can influence the gravimetric function of the dosing.

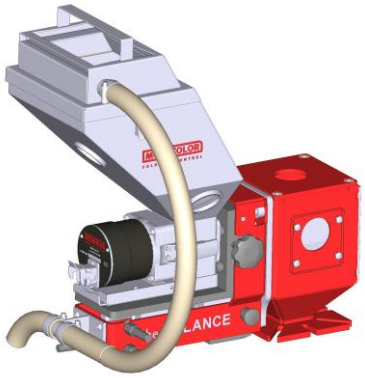
Introduction
Movacolor dosing units are capable of handling a variety of dry materials. Two different filling systems are available depending on the material properties.
-The Movacolor Ejector (ME) system for dust-free or nearly dust-free materials
-The Movacolor Vacuum (MV) system for materials that are NOT entirely dust free.
-The Support frame for external / foreign hopper loaders (EX)

The ME and MV systems are both driven by low-pressure compressed air and mounted directly on top of the hopper lid of the Movacolor dosing unit. The MC-Balance controls the operation of the ME or MV systems.

All parts are aluminum or stainless steel and are virtually maintenance-free. Only the filter needs to be cleaned periodically. To increase reliability and safety, there are no moving parts except for the pneumatic operated closing valve of the MV system.

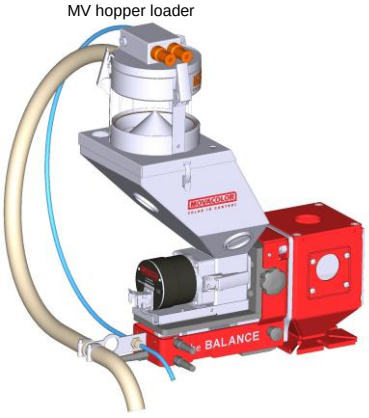
How the ME works
The ME system blows the material from the bag, drum or container into the hopper of the dosing unit. The hopper lid of the housing has a simple and easy-to-clean dust filter to keep any dust particles in the hopper. The system is triggered by the filling start weight (CONFIGURATIONS <menu>). This parameter also generates a low-level alarm if the hopper is empty.

ME hopper loader



How the MV works
The MV system uses a 3-stage vacuum generator driven by compressed air to create a vacuum that draws material into a chamber that closes. Once the chamber is filled with material, the cone that closes the chamber will open and the material will be discharged into the hopper.
The system is equipped with a superior filter to ensure that the finest particles (> 5micron) stay in the system and are not released into the atmosphere. This makes the MV system the most practical and user-friendly system for both powders and granules.

MV hopper loader

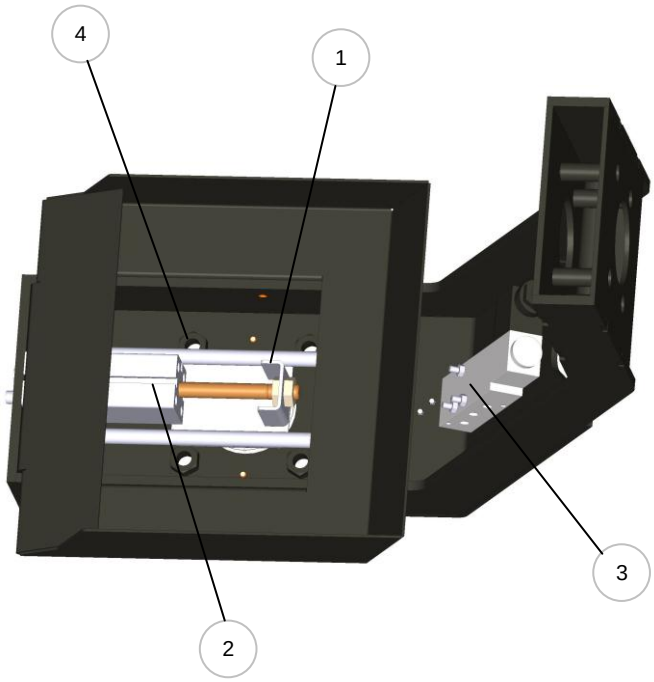


How the EX (support frame for External hopper loader) works
The function of the support frame is to use an foreign hopper loader in combination with the MC-Balance. The support frame is equipped with a knife gate valve for filling the hopper. The valve is normally closed. If the filling start level is reached (default 800gr.) the valve opens and the hopper is filled until the EX-H level (default 2500gr.). Then the valve will close automatically , so the support frame works independently from the hopper loader. If for some reason the weight reaches the EX-HH level a warning will be given. This can happen if for example the valve doesn't close.

EX hopper loader support frame

⚠ Do not take the dosing unit away before the compressed air of the valve is disconnected and press **STOP** on the controller to disable the valve because the knife gate valve can move!

ⓘ It could be necessary to use an customer specific intermediate plate between the hopper loader and the support frame to make a good fit.



1	Knife gate valve
2	Cylinder for open/close the valve
3	Solenoid valve
4	Connection Nuts (M10) for hopper loader mounting

General

ⓘThe hopper loader is only activated when the motor is On .

ⓘ Emergency stop.

To stop the hopper loader during production go to the HOPPER LOADER <menu> and switch the ME or MV system to **OFF**.

Hopper loader settings

This part of the manual describes how to configure the hopper loader. For further technical information about the hopper loader consult the specific hopper loader manual.

There are four ways to fill the hoppers:

1. Manual
2. Automatic with ME hopper loader
3. Automatic with MV hopper loader
4. Automatic with EX external hopper loader in combination with the support frame.

Manual

Open the hopper lid and fill the hopper by hand. (filling will be detected automatically)
The message “Low hopper level” appears when the hopper is empty.
(default 700 gr. In CONFIGURATIONS <menu>)

ME hopper loader (Movacolor hopper loader operated by compressed air)

ME FILLING SYSTEM	
ME system :	OFF/ON
Fill time :	30 sec
Alarm time :	31 sec
Alarm mode :	OFF/ON
Manual fill:	NO/YES

ME system: Switch ON / OFF the ME hopper loader system

Fill time: Fill time [sec.], during this time the system blows material into the hopper of the dosing unit.

Alarm time: Fill Alarm [sec.], if the hopper weight is not above the 800gr. within this time, the alarm starts. The alarm time can not set lower than the fill time.

Alarm mode: ME hopper loader is ON / OFF during fill alarm.
ON = ME Hopper loader stays activated during a filling alarm.
OFF = ME Hopper loader will be deactivated during a filling alarm.

Manual fill: Yes = starting filling immediately; No = stop filling immediately
Only visible with controller in STOP mode.
The Manual filling function can be used for example to fill the hopper before start of production.

ⓘ Highlighted Parameters are factory settings.

MV hopper loader (Movacolor hopper loader operated by vacuum)

MV FILLING SYSTEM	
MV system :	OFF/ON
Fill time :	20 sec
Empty time :	05 sec
Fill cycles :	3 x
Alarm cycles:	10 x
Alarm mode :	OFF/ON
Manual fill:	NO/YES

MV system: Switch ON / OFF the MV hopper loader system

Fill time: Fill time [sec.], during this time the MV system sucks material into the vacuum chamber.

Empty time: Empty time [sec.], during this time the cone that closes the chamber will open and material falls down into the hopper of the dosing unit.

Fill cycles: Number of extra fill cycles after the hopper weight is above the 800gr. again

Alarm cycles: Number of idle fill cycles before fill alarm. The number of alarm cycles needs to be more than the number of Fill. cycles.

Alarm mode: MV hopper loader is ON / OFF during fill alarm.
ON = ME Hopper loader stays activated during a filling alarm.
OFF = ME Hopper loader will be deactivated during a filling alarm.

Manual fill: Yes = starting filling immediately; No = stop filling immediately
Only visible with controller in STOP mode.
The Manual filling function can be used for example to fill the hopper before start of production.

ⓘ Highlighted Parameters are factory settings.

EX hopper loader (support frame for external hopper loader)

EX FILLING SYSTEM		
EX system	:	OFF/ON
EX alarm time	:	31 sec
EX alarm mode	:	OFF/ON
Manual fill	:	NO/YES

EX system: Switch ON / OFF the Support frame system.

Alarm time: Fill Alarm [sec.], if the hopper weight is not above the filling start level within this time, the alarm starts.

Alarm mode: EX hopper loader is ON / OFF during fill alarm.
ON = The system stays activated during a filling alarm.
OFF = The system will be deactivated during a filling alarm.

Manual fill: Yes = starting filling immediately; No = stop filling immediately
Only visible with controller in STOP mode.
The Manual fill function can be used for example to fill the hopper before start of production.

ⓘ Highlighted Parameters are factory settings.

Output signals

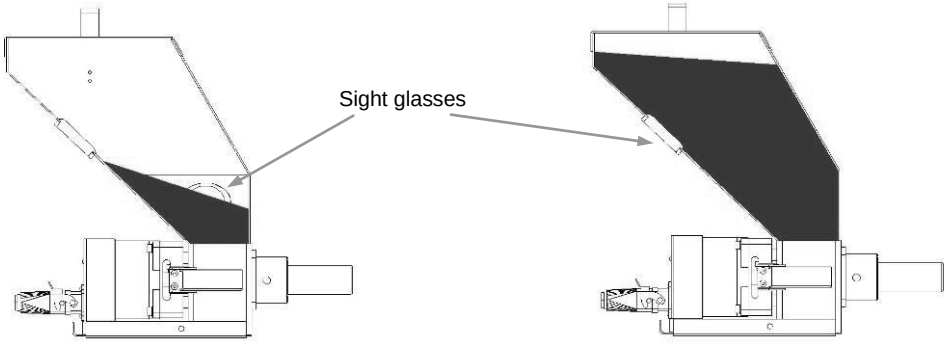
During fill time there will be a 24VDC signal between connection 24 and 25 on the main board to activate the pneumatic solenoid valve.

When the Fill Alarm is activated there will be a 24VDC signal between connection 22 and 23 on the main board to activate the flash light. The controller itself gives a beeping signal and the alarm LED will light up.

GENERAL RECOMMENDATIONS FOR OPTIMAL HOPPER FILLING

To guarantee the optimal working of the gravimetric MC-Balance dosing unit it is important to use the correct rate of hopper filling. The higher the output of the dosing unit (kg/h), the more important becomes the rate of hopper filling.

During hopper filling, the electronics of the MC-Balance controller recognize automatically that the hopper is being filled. This automatic filling detection is working for manual filling of the hopper and filling with an automatic hopper loader.
In the period that the hopper is being filled, the MC-Balance is dosing with a fixed RPM, this means the unit runs temporarily volumetric. As soon as the hopper filling is ready, the MC-Balance immediately continues to work gravimetric.
Because the MC-Balance is working volumetric during a hopper filling it is recommended to reduce the amount of filling cycles. Or in other words, to enlarge time between a filling moment and the next filling moment. This can be performed when using the correct settings of the “Filling start level” and the “Filling stop level”.
When the unit is started with the autostart function enabled and the unit is switched OFF and ON again the filling will start automatically if the hopper weight is too low.



Filling start level

Filling stop level

The moment when the automatic filling starts depends on the entered start level:

Filling start : xxx gr. (*configuration menu*)

Filling stop level is depending on the entered fill time for the ME-system:
Fill time : xxx sec

For the MV-system:
Fill time : xxx sec
Empty time : xx sec
Fill cycles : …. x

(*hopper loader menu)*

Recommended settings for ME hopper loader:

-Use for the filling start weight a level like shown in the filling start figure above, when using a to high weight level the amount of filling cycles will increase.
-Use a fill time so that the material covers at least the sight glass in the back of the hopper. Overfilling of the hopper should be avoided

Recommended settings for MV hopper loader

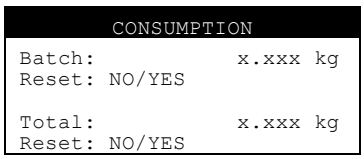
-Use for the filling start weight a level like shown in the filling start figure above, when using a too high weight level the amount of fill cycles will increase.
-Use a fill time so that the vacuum chamber of the MV-Loader is filled almost completely. Overfilling of the vacuum chamber should be avoided.
- Use for the empty time not a longer time that necessary but a to short empty time can cause decrease of the capacity of the MV-hopper loader.
- For the amount of filling cycles use an amount so that the material covers at least the sight glass in the back of the hopper. Overfilling of the hopper should be avoided

Recommended settings for EX hopper loader (support frame):

-The Volume of the hopper is 6 liter. To set the EX-H level (stop filling). It is recommended to take a safety margin to prevent the hopper of overfilling.
- EX-H (gr.) = 5 (liter) x bulk density (gr./liter)
For example: If the bulk density = 700 gr./liter, the EX-H should be set to 700 x 5 = 3500 gr.
The EX-HH (gr.) should be set higher, recommended 700 x 6 = 4200 gr.
Overfilling of the hopper should be avoided because it influences the measurement.

7.11 Consumption

The consumption menu will be visible when an automatic filling system is selected and enabled in HOPPER LOADER <menu>. Without use of the optional Movacolor filling system, accurate working of the consumption registration is not supported.
With the Consumption function it is possible to view the total quantity of material dosed by the MC-Balance. The consumption is saved in the memory and remains in the memory even when the unit is shut off or unplugged.
To reset the consumption go to reset and select YES and confirm.



Batch: Consumption of a batch (kg.)
Reset: Reset for batch consumption

Total: Total consumption (kg.) independent from Batch consumption
Reset: Reset of total consumption **&** Batch consumption

ⓘ The consumption is updated every 10 seconds.

7.12 Alarms

GENERAL
To reset an alarm / warning press Stop or the menu button.
When an error occurs using the MC-Balance, the display will indicate an error code and description.
Together with the displayed error an output contact will be switched.
The controller itself gives a beeping signal and the alarm LED will lighten up.

We distinguish Warning and Alarm:

Warning: Warning output is ON, but the dosing unit continues running (24VDC contact, pin 22-23 of the main board will be active, for example to activate the flash light,)

Alarm: Alarm & Warning output is ON and the **dosing unit stops running** (Potential free contact, pin 26-27 of the main board will be active, for example to stop the Injection molding machine or extruder, & 24VDC contact, pin 22-23 of the mainboard will be active for example to activate flash light).

Free programmable errors can be configured to an **Alarm** or **Warning**.
For setting the free programmable outputs into alarm or warning, enter the ALARMS menu.
First the alarm history will be shown. The alarms and warnings will be stored inhere.
When you press the menu button again you will enter the alarm configuration menu.
Here you can set the alarm- or warning output with and confirm.

ALARM HISTORY
All alarms and warnings will be stored in the alarm history.

- Go to the ALARMS <menu>
- Press to scroll to the stored alarms (max.50).

The alarm history can be reset by the supervisor in CONFIGURATION <menu> by

- **Master reset: Alarm**

We have the following Errors:

Error Code	**Warnings**	
00	Low hopper level	Material is below the hopper empty weight
01	Maximum deviation exceeded	The deviation of the material output is too high
02	Filling system unable to load material	Fill system is not working correct
03	Maximum RPM exceeded, change dosing tool for higher capacity	Calculated motor speed is too high
04	Maximum deviation exceeded	The deviation of the material output bigger then 90%
05	Calibration, no weight change	No weight change while calibrating
06	Hi-Hi level	Hopper weight has reached the EX-HH level
07	Minimum motor speed < 0,1 RPM	Calculated motor speed is too low
	Alarms	
08	Motor connection failure	Motor not connected / Motor or connection damaged
09	Parameters damaged	Check configuration parameters
10	Parameters set to factory defaults	Check all parameter settings
11	Load cell calibration set to factory defaults	Recalibrate the load cell
12	Job and curve database initialized	Jobs and Materials are reset
13	Load cell connection failure	Load cell connection is not correct

WARNINGS

All **warnings** are self eliminating, except Error code 05.
It is possible to cancel a warning, but when the error remains, the warning will return after 60 seconds. This gives the operator the time to solve the problem without having the alarm on.

Error 00	**"Low hopper level"** **[free programmable]** If this warning appears the material in the hopper is below the hopper empty weight (700 gr.) In CONFIGURATION <menu> this setting can be changed. - Check if there's enough material in the hopper. - Check the hopper empty setting in CONFIGURATION <menu> - Check if the hopper loader is working right.
Error 01	**"Maximum deviation exceeded"** **[free programmable]** If this warning appears the dosing output (grams/sec) is consistently not within set percentage. See page 18 for more information.
Error 02	**"Filling system unable to load material"** **[free programmable]** If this warning appears the alarm time (ME hopper loader) or alarm cycles (MV hopper loader) are exceeded. - Check if there is enough material. - Check if the material is stuck somewhere. - Check the operation of the hopper loader. - Check the hopper loader settings.
Error 03	**"Maximum RPM exceeded, change dosing tool for higher capacity"** **[free programmable]** Calculated motor speed is higher than the maximum of 200 RPM - Check the material output on 200 RPM. - Check the production settings. - Increase the dosing time (if possible) - Take another dosing type with higher output, for example a feed screw A20
Error 04	**"Maximum deviation exceeded"** **[coupled to Error 01]** If this warning appears the dosing unit output (grams/sec) is not within 90% of the set percentage. This warning is based on a faster measurement than used for Error 01. - Check if the dosing tool is blocked - Check if there is enough material
Error 05	**"Calibration, no weight change" "** No weight change while calibrating (see chapter 7.6) - Check if there's enough material in the hopper. - Check if the material is stuck in the dosing cylinder. - Check if the load cell is connected correctly. - Check the weight data by doing a weight check (see chapter 7.5) - Check if there are no vibrations that may have influence. - Check the rotation direction of the dosing cylinder. Front view to the right
Error 06	**"EX-Hi Hi level"** **[free programmable]** - Check if the knife gate valve is in closed position. - Check if the knife gate is sliding. - Check if the parameters EX-H level and EX-HH level are set OK.
Error 07	**"Minimum motor speed < 0,1 RPM"** **[free programmable]** Calculated motor speed is lower than the minimum of 0,5 RPM - Check if there's enough material in the hopper. - Check the production settings. - Decrease the dosing time (if possible) - Take an other dosing type with lower output, for example a GL-cylinder - Check the rotation direction of the dosing cylinder. Front view to the right

ALARMS

Error 08	**"Motor connection failure"** Motor connection is not correct. - Make sure the motor is connected. - Check cable and connectors for damage.
Error 09	**"Parameters damaged"** Some configuration parameters are incorrect. - Check the configuration parameters.
Error 10	**"Parameters set to factory defaults"** All parameter settings are reset to factory defaults. - Check all parameter settings.
Error 11	**"Load cell calibration set to factory defaults"** Load cell calibration is incorrect and reset to factory defaults. - Recalibrate the load cell !
Error 12	**"Jobs and curve database initialized"** All Jobs and materials are reset - Make new material calibrations and Jobs.
Error 13	**"Loadcell connection failure"** -Load cell connection is not correct. -Load cell connector is not connected to the controller.

7.13 Status signal

STATUS SIGNAL
The “status signal” can be used as a Start/Stop condition for the moulding machine
Default the output 4 (OUT 4) is always on in production mode (status Dosing or Standby)

Status = STANDBY or DOSING → relay 28/29 is CLOSED

Status = STOP → relay 28/29 is OPEN

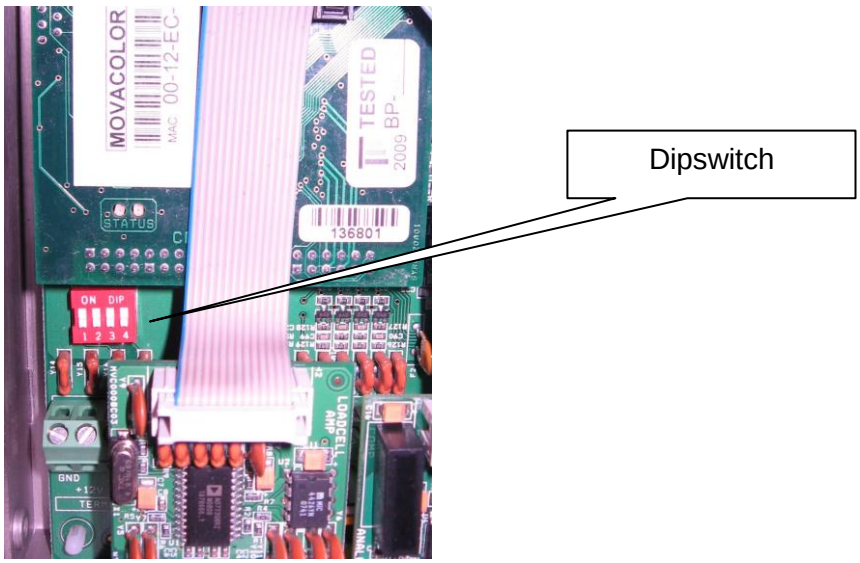
Relay 28,29 is normally open (MC-Balance in STOP modus or Main power switched OFF)

RUNNING SIGNAL (default function before V5.0)
“OUT 4” can also function as an running signal, for example to control a MIXER ON/OFF.

Status = DOSING → relay 28/29 is CLOSED

Status = STANDBY → relay 28/29 is OPEN
Status = STOP → relay 28/29 is OPEN

To select this “running signal” option, the dipswitch nr.3 on the Mainboard has to be placed in the “up” position:



7.14 Files

In this “File manager” menu, files (Jobs and Material curves) can be searched, renamed and deleted.

When entering the file manager menu, two file types can be selected:
Material (material calibrations) or Jobs (Production jobs).
After confirming, the file list will be shown. Now you can search for files, rename or delete them.

If the Job or Material curve you search for is not in the list fill in the first letter(s) or complete name and confirm. Now a filtered list appears.
To go back to the main list fill in spaces and confirm.

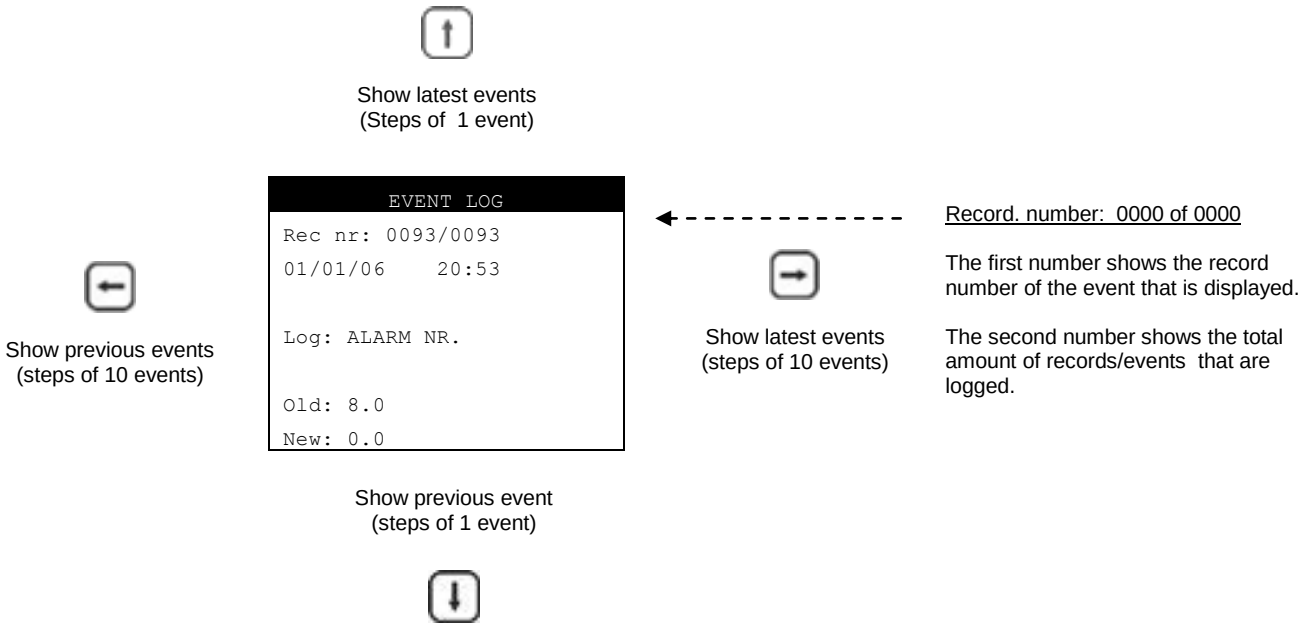
It is also possible to fill in the Job or Material description immediately in the File Manager and confirm. To clear the description fill in spaces or select an empty job out of the list.

Search: = Scroll through the files.
Delete: = Delete a file, press enter to confirm.
Rename: = Rename a file, press enter to confirm.

7.15 Event LOG

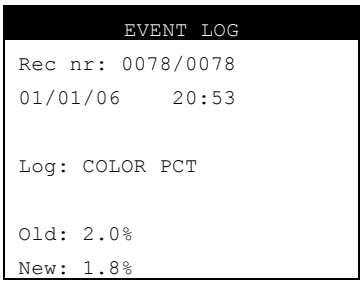
Setting changes made with the controller are stored in the Event Log.
Each event is filed with record number, date and time.

Approximately 7000 events will be stored in the memory of the controller, if the memory gets full the latest event will be logged and the oldest event will be deleted (first in / first out shift register).
It is possible to store these events to a PC.


Show latest events
(Steps of 1 event)
EVENT LOG
Rec nr: 0093/0093
01/01/06 20:53
Log: ALARM NR.
Old: 8.0
New: 0.0
Show previous events
(steps of 10 events)
Show latest events
(steps of 10 events)
Record. number: 0000 of 0000
The first number shows the record number of the event that is displayed.
The second number shows the total amount of records/events that are logged.
Show previous event
(steps of 1 event)

Event LOG of Alarms

The error code of an alarm or warning will be logged when an alarm or warning occurs.
The error codes can be found in paragraph 7.12



To effectively use the Event Log be aware that the correct data an time must be set in the CONFIGURATION menu.

8. System performance

System performance can be characterized by the time it takes the unit to reach the desired set point, the accuracy of the set point and the regularity of the material output.

The algorithm is self-adjusting to the conditions and because the conditions vary, it cannot be predicted how long it will take the unit to adjust itself and reach a set point with certain accuracy.

The following variables influence system performance:

Material properties. Easy flowing, non-sticky and non-static material that comes in the form of small granules or powder can be dosed very accurate and regular. The accuracy and regularity of material output drops with increased granule size. However this is only a problem with extreme low outputs.

Periodical cleaning of the dosing cylinder and seals is necessary for proper operation.

Extreme vibrations and shocks influence system performance noticeably. Normally the system will be able to compensate for vibrations and shocks.

The MC-Balance algorithm needs a certain time to weigh material loss and adjust the RPM accordingly. This time depends largely on the set point and the above mentioned two variables. The system constantly adjusts itself to reach the best possible accuracy for current conditions. Over time it can reach an accuracy within ± 1%.

Under “normal” circumstances the unit will be more accurate than 10% after the first adjustment of the RPM.

Before the unit makes its first RPM adjustment it might be running already very close to the desired set point because it uses a cylinder and material reference system to determine the first RPM setting. This accuracy however can not be guaranteed because material properties can vary substantially from material to material.

With injection molding the shot to shot accuracy depends, besides the variables mentioned so far, on the shot time. If big and heavy granules have to be dosed in a very short time this will influence the shot accuracy and repeatability because one granule can make a difference of a few percent to the shot weight.

An unstable relay or tacho signal has a negative effect on the accuracy, repeatability and speed of the system because it will adjust to these parameter changes.

A long cycle time combined with low dosage per shot can result in a slow system.

8.1 Reset regulation

- Changing one parameter during production will cause the balance to adjust to the changes but it will not reset the regulation totally.
- Changing more production parameters during production within 10 seconds after each other will cause the Balance regulation to reset. This is necessary for the system to adjust quickly to these big changes in the settings.
- Switching the power OFF and ON again will also cause the regulation to reset.
- Motor OFF and ON again will only cause the regulation to pause. The start up RPM will be the same as the last RPM before the stop.
- Changing one parameter with motor OFF causes total reset of the regulation.
- With auto start = ON (CONFIGURATION <menu>) the motor follows the last status (motor Standby or motor Stop status) and causes total reset of the regulation.

9. Trouble shooting

Problem : The balance does not come into specification or a Maximum deviation alarm occurred.
Possible causes:

1. Check if all cables are connected correctly.
2. Check if the transport protection is removed from the load cell safety bolt.
3. Check if the hopper assembly is fixed tightly to the weighing platform and that the neckpiece is fixed tightly to the production machine.
4. Check if the dosing cylinder is tightly fixed to the motor shaft.
5. Excessive build up of material on the dosing cylinder may have impact on proper dosing. To avoid this, be sure that the seals and dosing cylinder are clean.
6. Check if there is no tension on the cables connected to the weighing platform.
7. Use the weight check function with the reference weight to determine the correct function of the weighing system.
8. If the weight check gives the correct result, check if the material flow into the cylinder has been blocked.
9. Another cause may be an obstruction to the weighing system. Check if there is at least ≈ 1mm space between all the pointed screws and the load cell frame or platform and that there is no material or dirt blocking the movement.
10. In case of a water cooled neckpiece, check if there is material build up around the dosing cylinder and the water cooled pipe that can obstruct the free movement of the weighing system.
11. Check if the input signal is stable.
12. If none of the above causes the problem, recalibrate the system and try the weight check again.

Problem: The balance does come into specification but seems to be slow.
Possible causes:

1. Extreme vibrations and shocks to the system.
2. Extreme low Setpoint. See Chapter 8: SYSTEM PERFORMANCE
3. Check in case of use of an automatic hopper loader if the hoses are connected in the right way.

Problem : The input/start-signal is connected but the unit does not recognize this start signal.
Possible causes:

1. Check if the correct wires are connected for potential free contact, potential contact or tacho. Also check if the + and – side are connected correctly.
   [See chapter 6.5 , 7.4 and the Wiring diagram in Appendix B.]
2. The first delivered series controllers has a different main board than the present ones. The changes in the wiring diagram for main boards with the code MVC000BA02 (version 2) regarding to the MVC000BA03 (version 3) can be seen in appendix B.
   The version code is printed on the main board.
3. Automatic fuse is activated, this can for example happen when there was a short-circuit at the input connection. To deactivate the automatic fuse the controller needs to be switched OFF for a while and ON again, but first check and repair the short-circuit.

Problem: The hopper weight is not stable.
Possible causes:

1. Check if the weighing signal is not influenced by external circumstances, for example that the loadcell cable passes near to electromagnetic fields or electro motors.
2. Extreme vibrations and shocks to the system.
3. Check if there is no obstruction to the weighing frame.
4. Check in case of use of an automatic hopper loader if the hoses are connected in the right way.

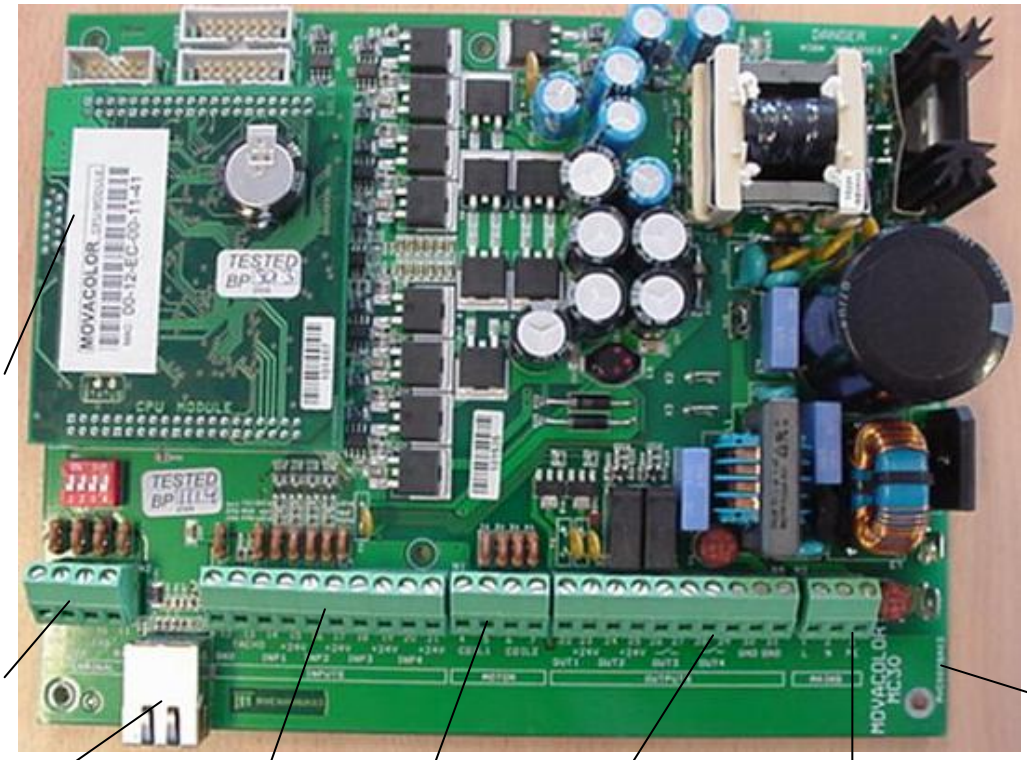
APPENDIX A: MC-Bal. Print view

Flat cable connection between terminal and mainboard

Terminal (display)

Flat cable connection between mainboard and load cell board

Load cell board



1) Processor board Incl. Mac-address

2) External terminal connection

3) Connection to PC or Network TCP/IP

4) Inputs

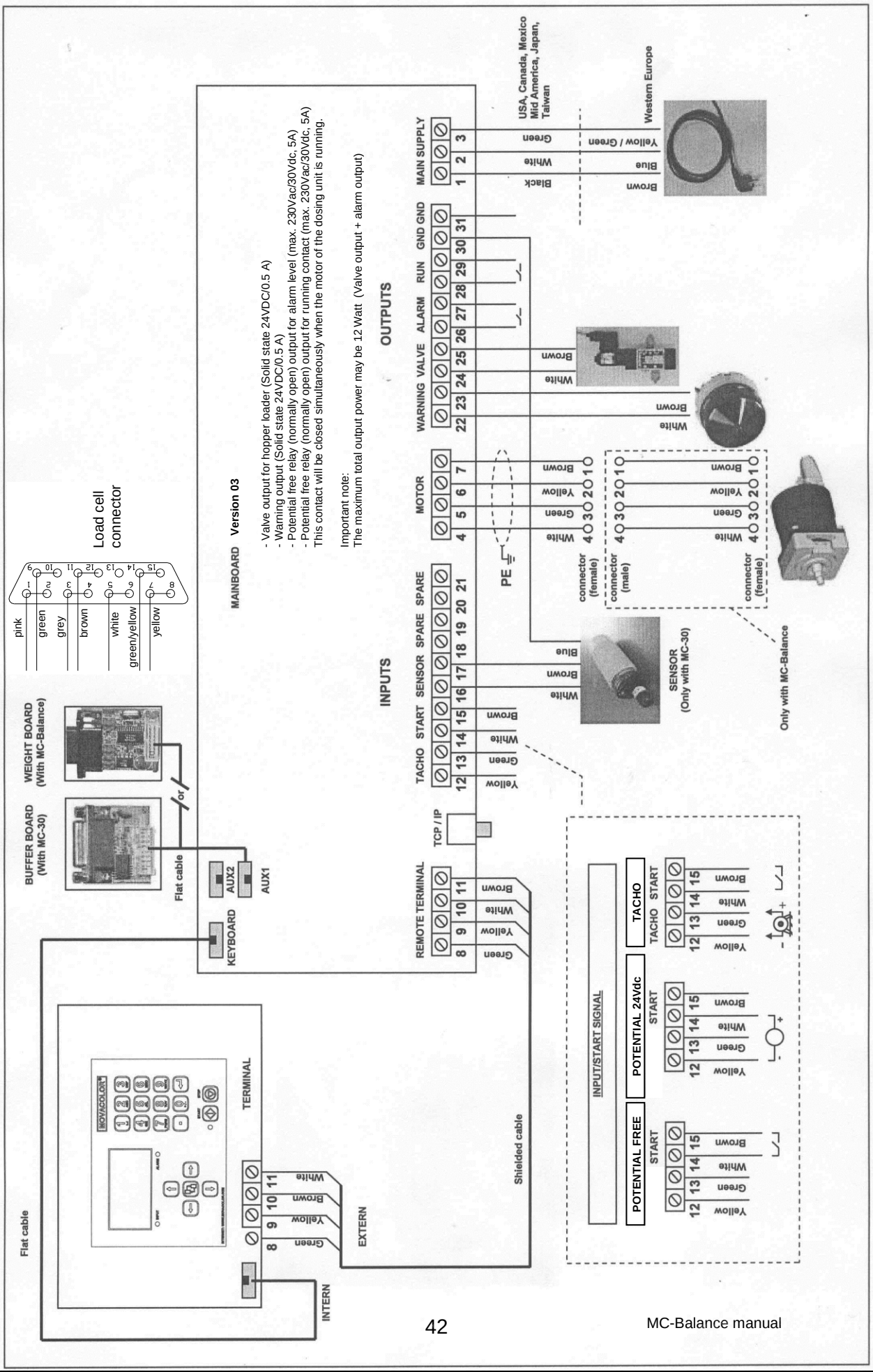
5) Motor

6) Outputs

7) Power supply

8) Identification mainboard version

APPENDIX B: MC-Bal. Wiring Diagram



APPENDIX C: MC-Bal. Technical Specifications

Controls:
Set and actual % setting for injection molding and extrusion
Extrusion control by relay or tacho
Injection molding control
Automatic metering time synchronization or by manual timer
Manual speed and time setting
Speed: Manual setting from 0,1 to 200 RPM max, in increments of 0,1 RPM.
Time: Manual settings from 0,1 to 999 sec in increments of 0,1 sec.
3 keyboard lock levels
Integrated hopper loader controller

Monitoring/System Information/External communication
128 x 84 full graphic LCD front display with integrated backlight.

Man/Machine interface:	Using full language command structure
External Communication:	PC link using TCP/IP internet protocol; optional RS232 or 485 available
Alarm:	2 user alarm levels

Specifications/Standards & Directives/ Technical data:

Power supply:	Operating power from 80 VAC to 260 VAC, 50 and 60 Hz by integrated automatic voltage selector
Power consumption:	80 Watt maximum
Stepper motor:	(1,8degr/step) max 2A or 4A(high output) at 40 Volt.
Operating Temperature:	-20 to +70 degr. C.
Load cell and electronics:	20 bits A/D resolution with a full digital filtering

Input signal(s):

Injection molding:	Start/Stop trigger input, potential free or 24VDC*
Extrusion:	Start/Stop trigger input, potential free or 24VDC* Tacho input 0..30VDC

* Note potential contact
Guaranteed OFF: 0-8VDC
Guaranteed ON: 18-30VDC

Output(s):
-Stepper motor max. output 2A or 4A(high output) at 40VDC
-Solid state 24VDC/0.5 A output for valve hopper loader
-Solid state 24VDC/0.5 A output for external warning
-Relay for alarm level (max. 230Vac/30Vdc, 5A)
-Relay for running contact (max. 230Vac/30Vdc, 5A)
-Maximum total output power: 12 Watt (Valve output + alarm output)

Standard Directives:
Protection class: IP-50
According to CE standards:
IEC 61000-6-4:2007
(Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments)
IEC 61000-6-2:2007
(Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments)

Safety
- In case of overload due to short-circuit or incorrect connection, the power supply automatically shuts down.
- Opto insulated start input for connection to production machine.

Machine connection flange:
Standard flange NSt40-neckpiece with cleaning opening.
Inlet/outlet ø50mm/□40mm, steel epoxy coated RAL 3002

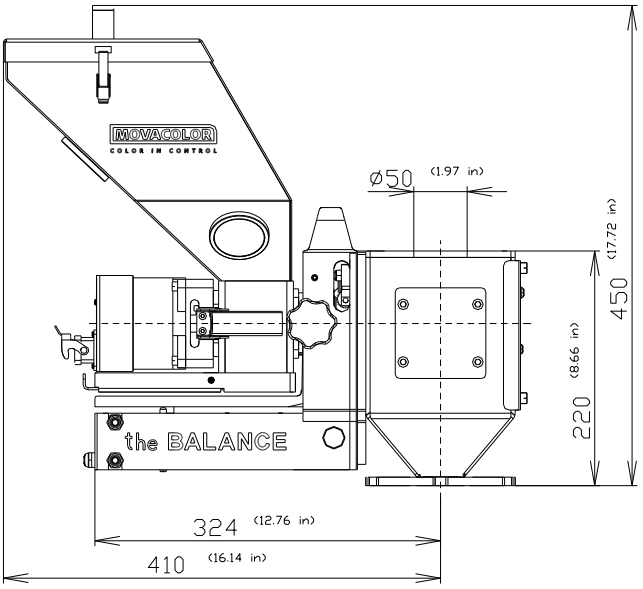
Loadframe:

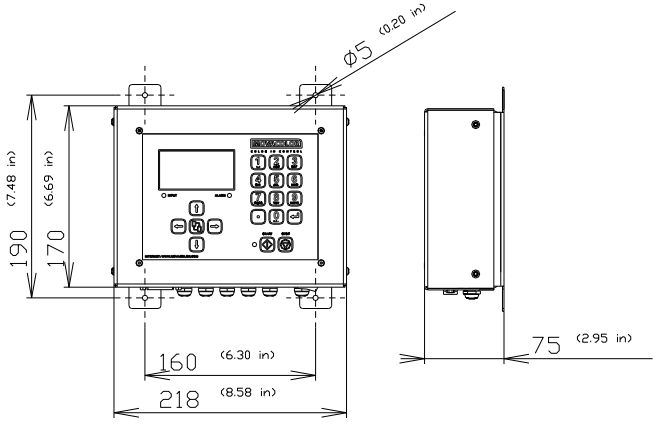
- Balance frame:	Steel, epoxy coated RAL 3002
- Weighing frame:	Aluminum, epoxy coated RAL 9005
- Loadcell:	Nominal Load: 20 kg. Temp. compensated Temp. range: -20…+60 gr. Celcius Protection level: IP63 EN60529

Optional parts
- 12 liter hopper stainless steel.
- Flange type NSt90 with cleaning opening and inlet/outlet Ø50mm/□90mm, steel epoxy coated.
- Water-cooled flange BH(A) inlet/outlet 50mm/50mm stainless steel ANSI 304.
- Water-cooled flange PHA inlet/outlet 100mm/100mm
- Hopper loader type ME
- Hopper loader type MV
- Mixers
- External Alarm Flash light.
- External Alarm Siren.

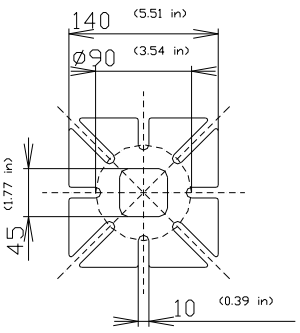
APPENDIX D: MC-Bal. Drawings General Dimensions

General dimension MC-Balance + NST40-Neckpiece

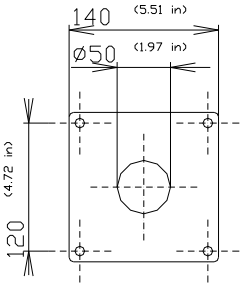




CONTROL CABINET

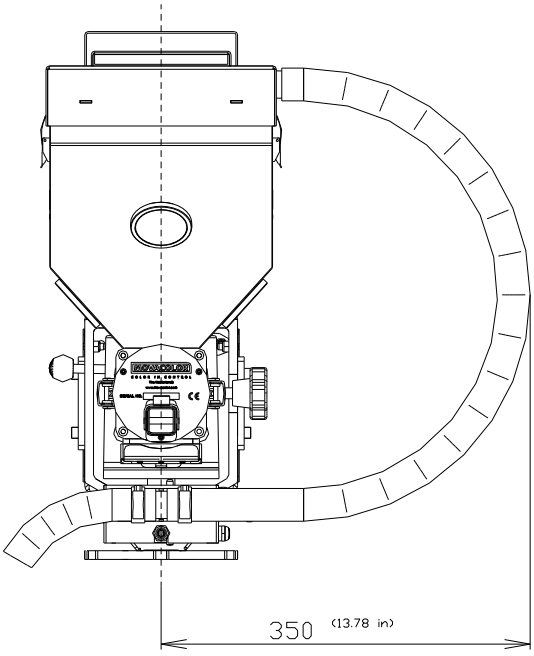


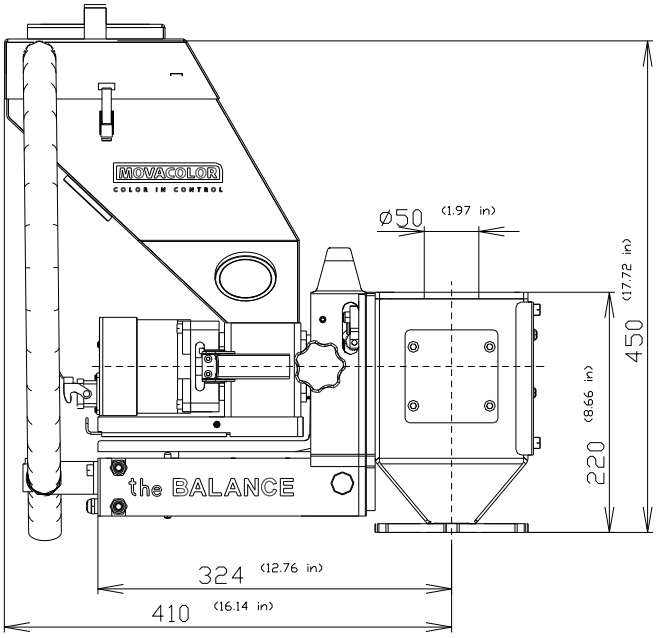
BOTTOM FLANGE

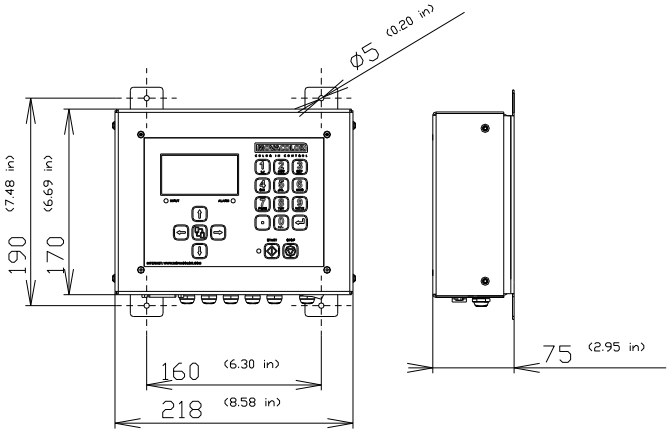


TOP FLANGE

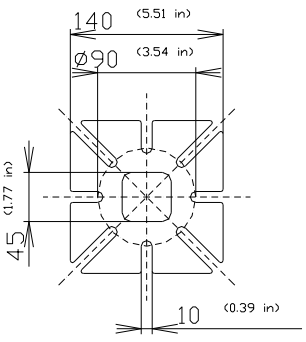
General dimension MC-Balance + ME25G + NST40-Neckpiece



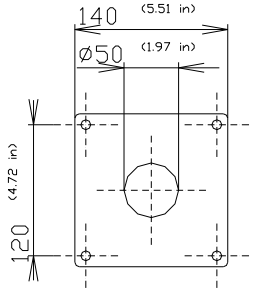




CONTROL CABINET

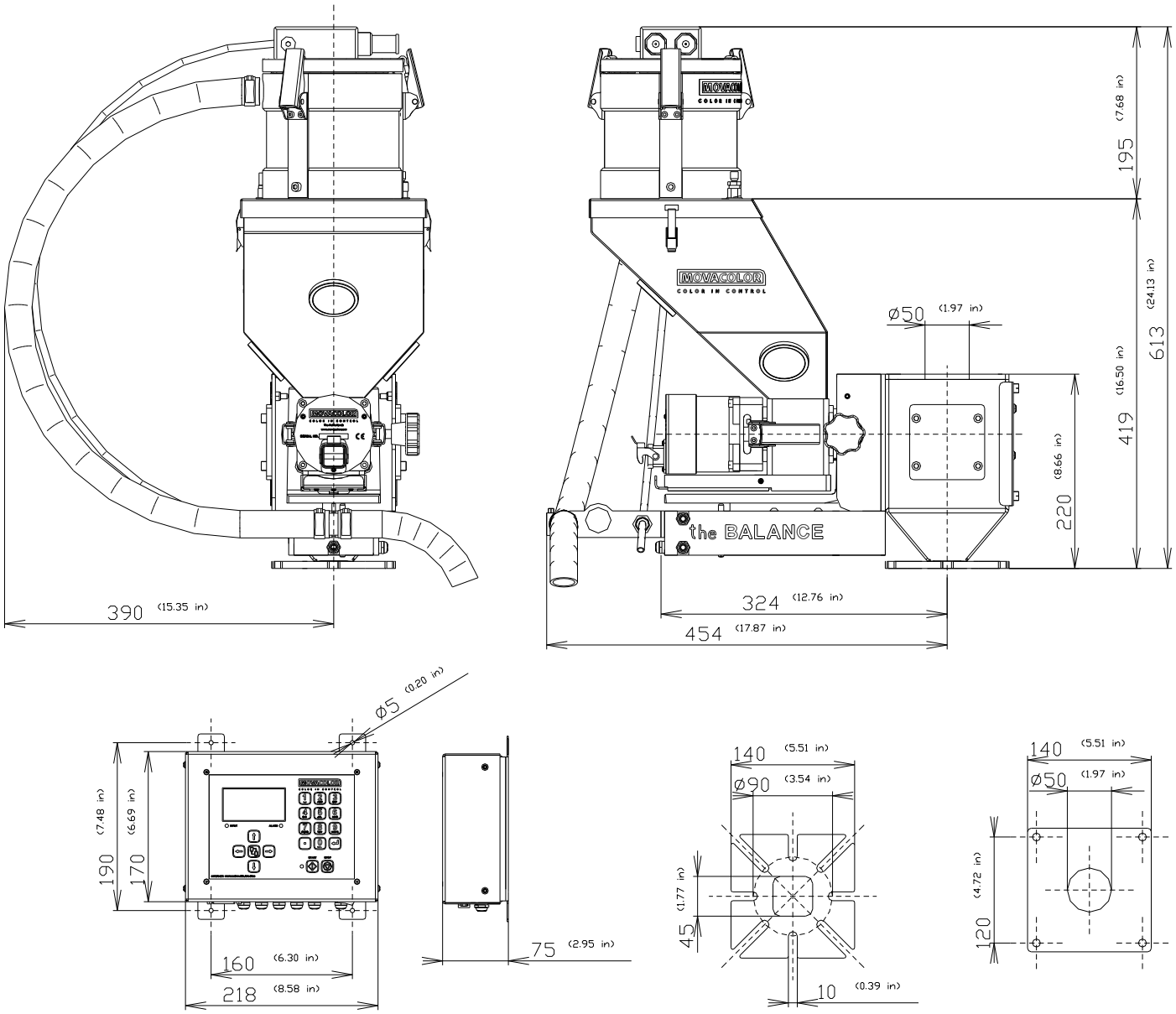


BOTTOM FLANGE



TOP FLANGE

General dimension MC-Balance + MV25G + NST40-Neckpiece



APPENDIX E: MC-Bal. Decl. of Conformity

DECLARATION OF CONFORMITY

(According to 2006/42/EC)

Manufacturer's name	**:**	**MOVACOLOR BV**
Address	**:**	**P.O. Box 3016** **8600 DA Sneek** **The Netherlands**

Declare under our sole responsibility that the product:

Name	**:**	**Movacolor**
Model	**:**	**MC-Balance**
Year	**:**	**20…..**
Serial nr.	**:**	……

- **Complies with the definition of the Machine Directive (2006/42/EG), and complies with the national legislation to enforcement of this directive;**

- **complies with the requirements of:**

Low Voltage Directive	(2006/95/EC)
EMC Directive	(2004/108/EC)

- **complies with the following standards or other normative documents:**

EN ISO 12100:2010	Safety of machinery, general principles for design, risk assessment and risk reduction.

(Signature) **Place: Sneek the Netherlands**

Managing Director **Date:** May 30, 2013